

# POPULAR Computing WEEKLY

40p

17-23 May 1984 Vol 3 No 20

BRITAIN'S BEST-SELLING MICRO WEEKLY

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SEE PAGE 51

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**★ STAR**  
Vic Connection  
on Vic 20  
see page 10  
**★ GAME**

## News Desk

### Palace raises the spirits

PALACE Software will release its first game—*The Evil Dead* for the Commodore 64—on June 15.

The game is based on the plot of the low-budget horror film *The Evil Dead* which is distributed by Palace Software's sister company, Palace Video. The film in which a group of teenagers become possessed by the spirits of the undead and finish each other off was the top-selling video of 1983.

The computer game of the film will sell for around £7.50 and the Commodore 64 version will shortly be followed by versions for the Spectrum and BBC micros.

Palace is the first film company to move into software. It plans a range of games developed from successful feature films. Palace has the video rights to David Bowie's *Merry Christmas Mr Lawrence*, the thriller *Diva* and a number of other horror pictures, including *Basket Case*, *Halloween* and *Chain-saw Massacre*.

The video of *The Evil Dead*

continued on page 5 ▶

### A new Dragon for Boots?

BOOT'S—the high street retail chain—may well pull out of selling the Dragon 32 computer at the end of the Summer.

Boots and Dragon have been negotiating over the future of the machine and it seems likely that the Dragon 32 will be replaced by a new Dragon home computer before Christmas.

Commented Dragon's chief executive Brian Moore, "To make a stark statement that Boots will not stock the Dragon 32 is to present only one piece of the equation. We are talking to them about replacing it with another machine which we have."

Although Boots is to stock the new machines from Amstrad and a selection of Japanese MSX micros, it will definitely continue to support the Dragon 32 with software and also sell the Dragon 64.

Said Boot's Peter Frost: "Dragon computers will continue to feature in our range—whether that is with the 32 or not I cannot say. We are aware of new products from Dragon 32."

Only a month ago British Home Stores decided to discontinue sales on the 32.



## ●●●●●●●●●● This Week ●●●●●●●●●●

● **Reviews** Includes a detailed look at Heathrow by Hewson Consultants on page 13 ● **Exclusive Review**

Beyond preproduction: Andrew Pennell with the first critical review of a Sinclair customers QL on page 16.

● **Networking** David Lawrence introduces a new series on page 26. ● **Commodore 64** Adrian Warman

discusses registers inside the SID chip. See page 34. ● **New Releases** This week's software includes Battle Planet

from ISP Marketing and The Pink Pearl from Astrosoft. Page 56.



# Sinclair ZX Microdrives and ZX Interface 1

## The affordable alternative to floppy discs...



## ...in the shops, now!

The unique ZX Microdrive system sets the ZX Spectrum apart from all other computer systems.

At a fraction of the cost of floppy discs, it gives fast access to 85K of program and data on Microdrive cartridges. And it opens up exciting possibilities through an RS232 interface and local area network.

### **ZX Microdrives – the fast way to save or load 85K of program and data. £49.95**

ZX Microdrives are controlled by ZX Interface 1.

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And when you want to display the data again, Microdrives give you lightning-fast access:

- Just 3.5 seconds to access a typical file.
  - Only 9 seconds to LOAD a typical 48K program.
- ZX Microdrives use the Spectrum's own power supply.

Your first Microdrive is connected to Interface 1 by a Microdrive lead. Then, up to 7 more Microdrives can be added using Microdrive connectors. That gives you a minimum of 680K bytes of on-line capacity.

With memory like that, the possibilities are limitless – stock control, word-processing, even huge adventure games!

With each Microdrive, you'll receive a Microdrive connector and Microdrive demonstration

cartridge. Blank Microdrive cartridges cost £4.95 each. They are available in packs of 4 (with a free cartridge wallet) or singly.

### **ZX Interface 1 – the multi-purpose controller. £49.95**

ZX Interface 1 is a multi-purpose device. It controls up to 8 Microdrives. And it adds file-handling and communication facilities to your Spectrum.

So in one low-priced unit, you also get these two built-in features:

- **RS232 interface** This industry standard interface allows you to link your Spectrum with full-size printers, communicate with other computers employing RS232, and transmit data over telephone lines via modems.

- **The ZX Net** Now you and your friends can transfer programs and data on a local area network – or even play computer games together.

The ZX Net makes it easy, and fast!

It links between 2 and 64 Spectrums, transmitting at 10,000 characters per second. (So a full screen is transferred in around 3 seconds!) With the ZX Net, only one person need type in a program. And a Microdrive or printer can be shared by everyone in the network!

ZX Interface 1 offers you all these facilities, and retains the same peripheral port as the Spectrum itself.

With each ZX Interface 1, you'll receive a connecting lead for the first Microdrive; a ZX Net

lead with jack plugs; plus a comprehensive manual.

An RS232 lead is available as an optional extra at £14.95.

**Available from:** larger branches of Boots • WH Smith Computer Stockists • Greens Computer Centres • Spectrum Computer Stores • and larger branches of John Menzies • Dixons • Laskys • Cussons • John Lewis Partnership • Rumbelows • British Home Stores • House of Fraser and many other good computer stockists nationwide.

### **Find out more – in your local shop!**

The best way to evaluate ZX Microdrives and Interface 1 is to see them for yourself.

There is a full range of ZX peripherals – including ZX Interface 2 for joystick and ROM Cartridge capability, alongside the only computer that supports them – the ZX Spectrum!

For more information, telephone Sinclair Research Ltd. on 0276 685311.

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**sinclair**



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Articles which are submitted for publication  
should not be more than 3,000 words long. The  
articles, and any accompanying programs,  
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copyright to copy programs out of other maga-  
zines and submit them here — so please do not  
be tempted.

### Accuracy

Popular Computing Weekly cannot accept any  
responsibility for any errors in programs we  
publish, although we will always try our best to  
make sure programs work.

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## Editorial

What's so great about the Japanese MSX standard for home computers? It's got a Z80 chip and 64K of memory. Rather like a Spectrum with a bit more Ram — and that is now two years old.

Yet go to the bar at any micro show and you will find directors and programmers from software houses talking about it. Why?

Because the world's largest electronics companies — Sony, Hitachi, Canon, Sanyo, Fujitsu and Yamaha — are all producing MSX machines and everyone is frightened. Frightened to ignore it. Frightened to be the one to say MSX isn't the best thing since sliced bread. And frightened to be left out.

Yet MSX is disappointing. Imagine the Japanese car manufacturers getting together and all producing vehicles based on the Ford Prefect.

The Japanese electronics companies are desperate to enter the home computer market and so between them they are attempting to artificially impose a standard. Unfortunately it isn't one to set the world alight. But they do have the marketing clout to make a big splash with MSX — just wait till the Sunday supplement ads and billboard posters go up.

Standards bring their own problems, though. What choice will there be but to establish yet another 'standard' in a few years time when MSX is technically even more old hat? By then though it will have served its purpose and sold a million.

## Next Thursday

Next week's star game is Fruity for Commodore 64 by Lee Turner — eat the fruit but avoid the mushrooms.

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# the LLAMA has LANDED!

..... and it's breeding fast.

Once upon a time, only Commodore owners could experience the thrill of playing an original game by Jeff 'Awesome' Minter. Lesser mortals could only sit and stare in wondrous rapture at the furry arcade action brought to you by Llamasoft.

**BUT NOW THERE IS HOPE.**

Dragon owners were the first to see the light of day, but now Salamander Software is pleased as punch to announce that selected titles **ARE NOW AVAILABLE FOR THE 48K SPECTRUM.**

Yes that's right, Salamander is now producing titles for the Spectrum, and the first of these are two great arcade games...

## **METAGALACTIC LLAMAS BATTLE AT THE EDGE OF TIME**

On a forlorn observation post at the edge of the galaxy, the Metallamas wait for a sign of Zzyaxian spaceships. Suddenly the alarm claxons blare, and the furry friends of freedom rush to the fore only to find that there are no attacking spaceships, and that they are under attack from Cyborg Arachnid Mutants and Disgusting Weeviloids.

This classic arcade game, originally developed by Jeff 'Awesome' Minter of Llamasoft, features 1 and 2 player options, spitting Llamas, Cyborg Arachnid Mutants, Disgusting Weeviloids, 99 levels of play. Joystick recommended. Supports Spectrum ZX Interface 2 and Kempston joysticks.

## **MATRIX: GRIDRUNNER II**

It is ten years after the infamous Grid Wars, and humanity is once again threatened by the evil droids, only this time they're back in force with new weapons and new allies.

The awesome sequel to the best selling Gridrunner, Matrix features all the old favourites like Droids and Zappers, but increases the panic quotient by adding Diagonal waves, Cosmic Cameloids, Energy deflexors, the Snitch and more.

Game originally developed by Jeff 'Awesome' Minter of Llamasoft. Joystick recommended. Supports Kempston and AGF joystick interfaces. In space, only the camels can hear you scream.

## **What some famous people have said...**

"What's an arcade game

Aristotle

"Awesome"

Jeff Minter

"I prefer elephants"

Hannibal

"Don't shoot me, I'm only the piano player"

Elton John

"Boing"

Zebedee



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## SOFTWARE

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Metagala in Llamas Battle at the Edge of Time £6.95 • Matrix £6.95 • Gridrunner £6.95 • Traxx £6.95 • Laser Zone £6.95

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## Evil Dead

4 continued from page 1

has had a controversial history. It was granted an '18' certificate by the British Board of Film Censors. Subsequently the film title has been among those branded a 'video nasty' by the press and police—a charge hotly denied by Palace founder Pete Stone.

He says, "The Evil Dead is a horror film—it is there to shock—but it is definitely an



entertainment film and not a video nasty. It could not be put in the same category as real video nasties like *Driller Killer* and *I Spit on Your Grave*.

## Record sales for CBM

COMMODORE International has announced record sales for the third quarter and nine month period ending March 31, 1984. Net income and earnings per share are also at an all time high.

Irving Gould, Commodore's chairman, said that the record figures resulted from continuing strong sales of micros in the business, educational and home market. Sales gains

"While *The Evil Dead* computer game is a horror game, we have gone out of our way to make sure there is nothing nasty about it. And it certainly doesn't set out to deprave or corrupt—far less in fact than other forms of media—comics, for example. In the game you have to defend yourself against some rather friendly-looking ghouls.

"I don't think there will be any controversy about it when people see the game."

The release of *The Evil Dead* computer game comes at a time when parliament has broadened the scope of the Bright Bill—designed to curb video nasties—to include video games. Under the Bill, video games which contain 'acts of gross violence' may have to be submitted to a video game equivalent of the British Board of Film Censors.

"Under the Bill, X-rated films will be banned on video and for computer games the situation will be even crazier," says Pete Stone, "Where do you draw the line—is *Space Invaders* an act of gross violence? The problem is that the people pushing these laws through have no idea what the video and computer games industries are about."

of the Commodore 64 were a major factor.

Commodore's founder Jack Tramiel, who resigned suddenly from the company in January, has bought a seven per cent stake in a California-based medical computer company, Adac Laboratories.

Jack Tramiel is now a director of Adac and is thought to be looking to play an executive role in the company.

## New offer from CGL

NEW buyers of the CGL Sord M5 home computer will be able to take advantage of CGL's latest offer.

The Starter Pack now includes a data recorder—valued at £38.95, in addition to the machine itself, Basic 1 Rom Cartridge, Basic 1 manual, us-



ers' guide, mains adaptor and tv connector cable. Yes the price stays the same £149.95.

## Acorn lights up

ACORN is in the process of taking over Cambridge-based Torch computers.

Torch uses the BBC circuit board as the basis for its micro. It also makes the Torch Z80 disc pack CP/M compatible second processor unit for the BBC micro.

Last year a take-over of Torch by GEC collapsed at the

last moment and Torch founder Martin Vlieland-Boddy was forced to resign as chairman.

Acorn's plan for Torch to become a wholly-owned subsidiary of Acorn apparently has the full support of Torch shareholders.

Only two weeks ago Martin Vlieland-Boddy announced that his new company Data Technologies would launch an IBM-compatible 8088 second-processor unit for the BBC micro. Called The Graduate, it offers the 8088, 128K Ram plus either one or two disc drives for £600 and £869, respectively.

## Mobile phone

RACAL Vodafone—a division of the Racal communications company—this week announces a revolutionary new computerised telephone system.

The company will announce a hand-held push-button radio telephone designed to be used on the move anywhere in the country—on foot, in a car or train.

The telephones will communicate with a nation-wide network of new computerised receiving stations connected to the conventional telephone service.

The computer controlling the system monitors the signal strength from each portable telephone; if the strength falters, the computer will automatically sample adjacent base receiving stations and switch the telephone to any station giving a stronger signal. In this way any moving telephone is kept in touch as it moves across the country.

Racal plans the system to be operational in early 1985.

## Flexing the Dragon

COMPUSENSE'S implementation of Flex on the Dragon is at last available.

The disc operating system will run either on the Dragon 64 or an expanded Dragon 32 and comes complete with an Editor/Assembler package at £86.25.

Under Flex 48K Ram remains free to the user (16K more than with Dragon Data's OS9) and a 51 x 24 screen is presented which the user can

## Speak your command

JCB Microsystems is working on a sophisticated speech recognition system for the Commodore 64, Spectrum and BBC computers.

The system, which will cost around £50 including a built-in microphone, will be the first low-cost speech recognition unit for a home micro capable of responding to a vocabulary of more than a few words. It can be taught to recognise the voice of its user speaking over 100 words. These spoken commands can then be used to trigger responses from a computer program. Since the package also includes a programmable speech synthesiser, in theory at least, conversations will be possible. It should be in production by the end of the Summer.

JCB has also finished work on the Commodore 64 version of its Dragon speech synthesis unit. The 64 version will be on sale next month, priced at £34.95.

define independently. Flex can run on any 5¼ inch disc drive, and can format single- or double-sided, single- or double-density discs.

Flex should be available through dealers within the next month.

Further details from Compuserp, 286D, Green Lanes, London N13.



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# Letters

## Loss of memory

**R**e Peek and Poke, May 3-9 1984, to the question headed 'Two Bytes Missing'. Mr Rogers answer is incorrect.

The ?FRE(0) statement does not take up any user memory as room is allocated for it (as with any other Basic statement) in non-user memory — in fact, the Basic Input Buffer.

The Vic counts free memory as that between the end of arrays (pointer locations 49-50) and the start of string storage (pointer 51-52).

When the Vic is switched on, 51-52 point to 7680, while 49-50 points to the byte directly after the end of the Basic program. But this is actually at 4099 rather than 4097 on the unexpanded Vic. This is due to the Basic program containing two bytes which one might not expect. These are the end link addresses, which are present in all Basic programs and signify the end of the program.

The end link address is always two zero bytes (0,0). These are present in memory even when no program is present and this is where T Multon loses the two bytes.

I hope this brief explanation is useful.

Mike Davies  
The Waverley  
79 Rhosmaen Street  
Llandello  
Dyfed SA19 6HD

## Bleep booster

**W**ith reference to Philip Venables, program (Key Bleeper in issue 17 Vol 3), there are many disadvantages to using this. Firstly, and most importantly, is that all programs no longer work! This is because the routine disrupts the multiple VDU calls. Thus, the command Mode 2 which should be sent as VDU 22,2 by the Basic Rom, is sent as VDU 7,22,7,2 causing a beep, a change to Mode 7, and will turn the printer on!

Many other examples can be found such as Print Tab(x,y) and all printer codes. Also, the

routine beeps whenever any character is printed on the screen. So, if your program has a lot of Print statements in or even if you are just Listing a program, cover your ears! On top of this, the program is Disc incompatible.

The accompanying program overcomes all these problems, and beeps only when a key is actually pressed.

The routine can be switched off by \*FX 13,2 and on again

```
10 REM Key Bleeper -
20 REM The REAL version
30 REM By Piyush Patel
40 P% = 0
50 I = 0
60 P% = 0
70 LDA#7
80 JBR #P%EE
90 PLA
100 RTS
110 J
120 T%220 = 0
130 T%221 = P% DIV 256
140 P% = 14,2
150 #BASIC
```

by \*FX 14,2. The beep channel can be changed by \*FX 211,(channel), the pitch can be changed by \*FX 213,(pitch) and the duration can be changed by \*FX 214,(duration).

It works by using the key-pressed event. When a key is pressed, the computer first indirectly via &220 and &221, which normally points to a RTS in Rom. However, if we change this to point to our new routine, the routine will be executed each time a key is pressed (regardless of what else is happening). P% in line 40 may be changed to relocate the code to another address.

Piyush Patel  
119 Abbs Cross Lane  
Hornchurch  
Essex RM12 4XR

## Too expensive

**W**hy is it that computer buffs who are selling their computers (presumably because they have acquired new ones) try to recoup the buying price? I was after a Vic 20 for my son and thought I would buy a second hand one. As we already had software, magazines etc, I hoped I would be able to pick up the computer and cassette for £70-£80. Boy,

was I wrong! The cheapest quote I could get from a private seller was £110.00 — without any guarantee. Needless to say, I bought a new one, and for just under £140 I got the Vic, cassette, four games, two cartridges and the Basic guide, part one.

The huge second hand prices asked for seem a bit odd — after all, you wouldn't expect to recoup the buying price on your car or stereo etc. I also believe that those people who try to sell second hand cartridges at around £5-£6 should note that if you buy one for £9.99 in a cert-in High Street shop, you get three free.

James Tosh  
16 Glenlyon Road  
Leven  
Fife

## Disgusted and appalled

**A**fter reading Mr Hickman's letter in PCW Vol 3 No 17 I found myself forced to wonder what kind of irresponsible person he is — firstly, his attitude to Mel Croucher in a previous letter (PCW Vol 2 No 51) was one which quite disgusted me. He seemed to be condemning Mr Croucher's noble course of producing non-violent and highly enjoyable games.

Then he has the nerve to make an attack on the moral decency of the nation — is he so naive that he thinks that the move to censor computer software was the work of do-gooders alone? I am assured that the move to include soft-

ware in the 'video nasties' bill was met with considerable approval from the popular press (well the Sun anyway).

I am both appalled and disgusted by the apparent lack of concern shown by Mr Hickman towards young children today, who need to be protected from violence in their early stages of development.

In Mr Hickman's earlier letter he claimed that all aggression was related to frustration, which is a fact I do not contest. But, he further suggests that playing computer games relieves frustration — we all know that this is not the case. How many cups of coffee have hit the wall when the aliens finally destroy your last ship and how many times have nasty words to the innocent resulted from a failure to pass 'mutant telephones'?

Jamie Purves  
27 Grass Walk  
Welford Road  
Northampton

## Chemical balance

**F**irstly, thank you very much for printing my chemistry program in your magazine (No 17). I would, however, like to point out some small printing errors in the write up to the program. When it says: 'As it is, the balanced equation is: 2 C4H10 + 13 O2 = 8 CO2 + H2O

There should be a 10 in front of the H2O, otherwise it is unbalanced.

At the bottom of the page, when an example was given, CO2 was missed off the product inputs and instead two H2Os were printed.

At the top of the page, on the right, a line is printed as: H2S + SO2 = H2O  
It should read H2S + SO2 = H2O + S.

Robert Crook  
N. Devon



"Christopher Robin went down with Alice..."

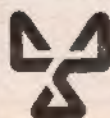
Apologies to our readers for any problems caused by our printing errors. These corrections should solve them.



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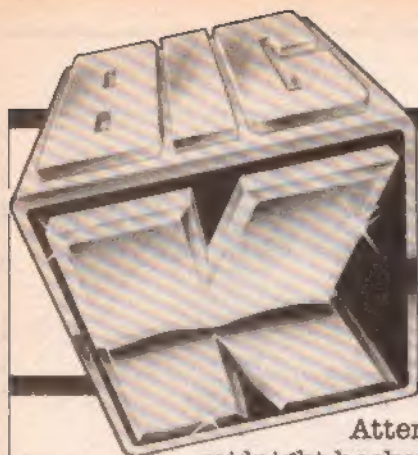


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Attention all you pixel-packers, midnight hackers and binary-bustin' bozos! Gorf's gift to gamesville has just hit the streets. Big K's the name and Big K's the game – it's a new magazine that's going to be music to your micros. Whatever Big K gets in its sights – technical, tactical or just plain old topical, don't expect anything typical. Big K **plays** it different and **says** it different. We're not afraid to shoot from the hip – and we're always hip when we shoot! We've a no-holds-barred approach to arcade strategy and adventure that'll have your CRT's tingling. Key in to Big K now for a magazine that puts news, reviews, programs and hardware under your fingertips. **After your first byte of Big K...the game will never be the same.**

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# Vic Connection

A new game for Vic20 by Ian Craighill

This game, for the unexpanded Vic 20, is a version of *Connect 4* for two to four players. The idea of the game is to place your beads (by pressing *Return*) to make either a vertical, horizontal or diagonal line of four. When this is accomplished, the Vic will automatically play a fanfare.

To avoid arguments, caused by accidentally placing a bead in the wrong column, there's a "check" key (*Space*) which helps to determine the position of the

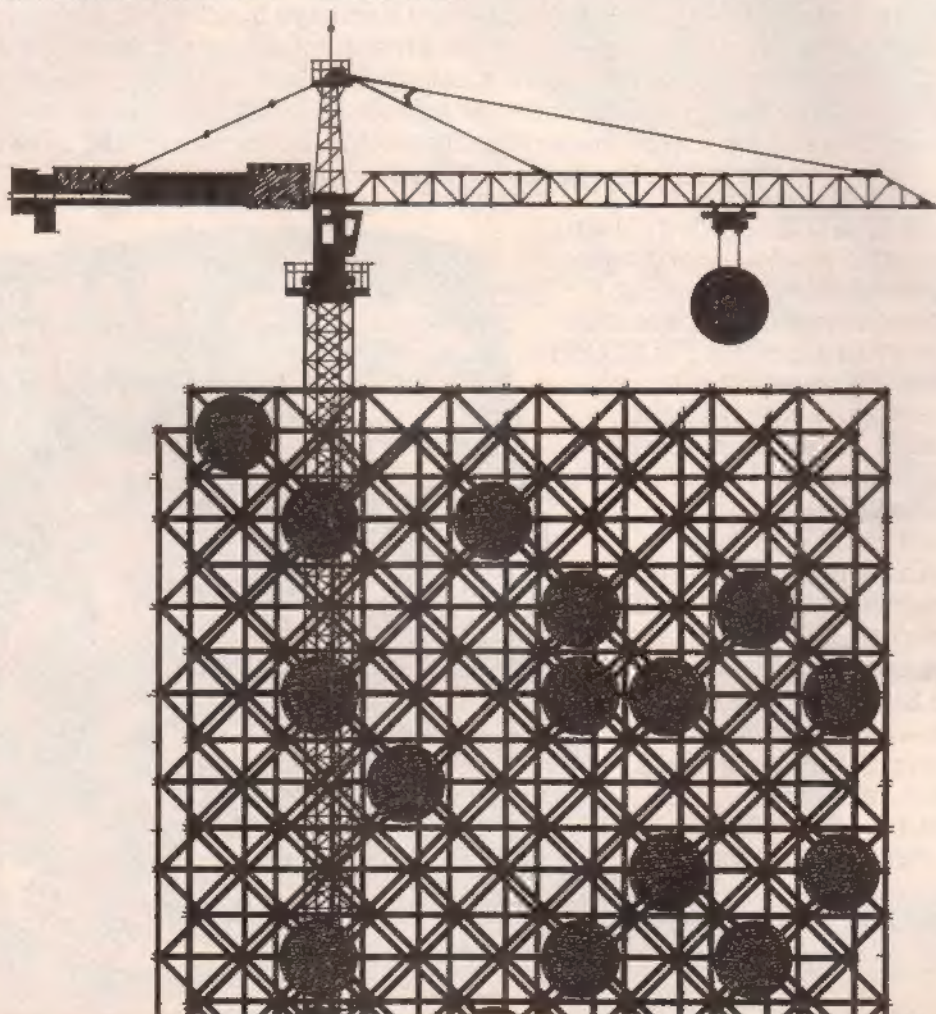
marker in relation to the beads. A bouncing routine is also included in the program.

## Notes

The most difficult part of the game to program was checking the number of beads (lines 700-750). If the computer wanted to find a horizontal line, it would use *Peek* to count left and right of the original bead. If the answer was three, then there was a line of four.

0-7  
30-40  
310-317  
320-340  
400-490  
500-520  
700-750  
800-910  
1010-1020  
1100-1130  
1500-1520  
2000-2094  
2095-2100

Rem statements  
Data for National Anthem  
Variables  
Set screen  
Movement options  
Bead drop  
Check lines  
Fanfare  
Players option  
"Check" Bar  
Bounce routine  
Instructions  
Tune





```

0 REM#####
1 REM#
2 REM#VIC CONNECTION#
3 REM#
4 REM# BY(C)
5 REM#IAN CRAIGHILL
6 REM#
7 REM#####
10 RESTORE
20 DATA1,22,21,23
30 DATA215,1,215,1,219,1,212,1,5,215,1,219,1,223,1,223,1,225,1,223,1,5,219,1,21
5,1
40 DATA215,1,215,1,212,1,215,1,~1,0
300 POKE36879,25 POKE36878,15 PRINTCHR(8)CHR(142)"J"
305 GOSUB2000
310 BA(1)=81 BA(2)=87:BA(3)=42 BA(4)=43 C(1)=5:C(2)=3:C(3)=8:C(4)=6:AR=7783:CO=
36720
315 V=7703:NM$(1)="GREEN CIRCLE":NM$(2)="CYAN CIRCLE":NM$(3)="BLACK STAR"
"
317 NM$(4)="GREEN CROSS"
320 FORP=7746TO8853 POKEP,91 POKEP+CO,2:NEXT
330 FORP=7688TO7701 POKEP,160 POKEP+CO,6 POKEP+374,160 POKEP+374+CO,6:NEXT
340 FORP=7688TO8854STEP22 POKEP,160 POKEP+CO,6 POKEP+21,160 POKEP+21+CO,6:NEXT
350 REM #####
360 REM # MAIN LOOP #
370 REM #####
380 GOSUB1000
400 FORT=1TO4
410 POKEV,BA(T) POKEV+CO,C(T)
420 GETA$ IFAS=" "THENM=20
430 POKEV,32
440 IFAS=" "THENV=Y+1
450 IFAS=" "THENV=Y+1
460 IFAS=CHR$(13)THEN500
465 IFAS="C"THENPOKE36879,27 PRINT"J"END
467 IFAS=" " THEN1100
470 IFV=7702THENV=7722
480 IFV=7723THENV=7703
490 GOT0410
500 E=Y+44 IFPEEK(E)091THENPOKE36876,220 POKE36876,0 GOT0410
510 POKEE,91 POKEE+CO,2 E=E+22 IFPEEK(E)091THENE=E+22 GOT0530
520 POKEE,BA(T) POKEE+CO,C(T) FORP=1TO50 NEXT GOT0510
530 Q=1 GOSUB1500 E=E+22 Q=0 GOSUB1500 E=E+22 Q=0 GOSUB1500 E=E+22 Q=0 GOSUB1500
0:E=E+22
532 Q=1 GOSUB1500 E=E+22 Q=0 GOSUB1500 E=E+22
535 POKE36876,220 POKE36876,0 POKEE,BA(T) POKEE+CO,C(T)
540 FORP=1TO4 GOSUB700 NEXTP RESTORE
550 NEXT GOT0400
700 READA D=E
710 D=D+A IFPEEK(D)=BA(T)THENSC=SC+1 GOT0710
720 A=A+(-1) D=E
730 D=D+A IFPEEK(D)=BA(T)THENSC=SC+1 GOT0730
740 IFSC=3THEN800
750 SC=0 RETURN
800 POKE36879,24+C(T)
805 FORP=164TO165 POKEP,99 POKEP+CO,C(T) NEXT
807 PRINT"#####LEFT:(NM$(T),1)#####NM$(T);
910 Z=135 FORP=1TO40 R=INT(RND(1)*8) Z=Z+2.5
820 POKEE+CO,R POKE36876,Z
845 D=E
850 D=D+A IFPEEK(D)0BA(T)THENPOKE36876,0 GOT0870
860 POKEE+CO,R POKE36876,0 GOT0850
870 D=E A=A+(-1)
880 D=D+A IFPEEK(D)0BA(T)THEN900
890 POKEE+CO,R GOT0880
900 A=A+(-1) NEXT
910 FORP=1TO300 NEXT:RUN
1000 PRINT"#####HOW MANY PLAYERS (2-4)"
1010 GETA$ IFAS0"2"ANDAS0"3"ANDAS0"4"THEN1010
1020 M=VAL(A$) PRINT"###" RETURN
1100 E=Y+44 Z=241 IFPEEK(E)091THEN410
1110 POKEE+CO,1 E=E+22 Z=Z-5 POKE36876,Z IFPEEK(E)91THEN1110
1115 E=E-22
1120 POKEE+CO,2 E=E+22 Z=Z+5 POKE36876,Z IFV=V+22THENPOKE36876,0 GOT0410
1130 GOT01120
1500 Z=PEEK(E) POKEE,BA(T) POKEE+CO,C(T) FORP=1TO50 NEXT POKEE,Z POKEE+CO,2
1510 IF0=1THEN POKE36876,220 POKE36876,0 RETURN
1520 FORP=1TO25 NEXT RETURN
2000 PRINT"#####INSTRUCTIONS-(V/N)" PRINT"#####
2010 GETA$ IFAS0"V"ANDAS0"V"THEN2010
2020 IFAS="N"THENPRINT"J" RETURN
2030 PRINT"#####INSTRUCTIONS" PRINT"#####
2040 PRINT"#####DROP THE BEADS DOWN" PRINT"#####THE GRID TO FORM A" PRINT"#####ROW OF 4"
2050 PRINT"#####NEITHER VERTICALLY," PRINT"#####HORIZONTALLY OR" PRINT"#####DIAGONALLY"
2060 PRINT"#####USE 'CRSR' DOWN TO GO" PRINT"#####LEFT, 'CRSR' RIGHT TO GO"
2070 PRINT"#####RIGHT, RETURN TO DROP" PRINT"#####AND 'SPACE' TO CHECK"
2075 PRINT"#####C' ENDS THE GAME"
2080 PRINT"#####PRESS SPACE"
2090 GETA$ IFAS0" " THEN2090
2094 FORP=1TO4 READGH NEXT
2095 READGH,RG IFGH=1THENRESTORE GOT02100
2097 POKE36876,GH FORP=1TO(RG+200) NEXT POKE36876,0 GOT02095
2100 PRINT"J" RETURN

```



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## Programs for the Acorn

When I first saw this package my mind went back to Christmas as a child, receiving attractive boxes containing compendiums of games.

One hundred programs for just over £10 is very good value. At 10p per program you would expect quite a lot of programs which exist purely to make the number up. However, apart from the odd one or two, the games represented excellent value for money.



The programs are presented in eleven sections, eg. Maths, Graphics. I cannot see how anyone could fail to find a wealth of material which he or she could not either use directly or take as the basis for development of a new program.

Section 1 seemed the weakest of the eleven. It is more a familiarisation exercise with the Electron than anything else. Section 2 covers the basics of games writing in a way which could form the basis for useful game development by amateur program writers. I particularly liked the *Business* and *At Home* sections which practically give you everything you want from a computer in business, and everything you want at home — from birthdays to investment and back. I couldn't help at this point wishing for a disc version as a lot of this section's programs were in file form.

Moving on, there are sections on *Mathematics*, *Painting*

*on the Screen*, *Data Handling*, *Recreation*, *The Science Lab* (most of it behind me with volumes of solids, colour codes for resistors, moments of inertia etc), *Graphics routines*, and, finally, *For the School*.

If you are looking for a collection of routines to get you started on your Electron, and introduction to a variety of games you can develop, how to check up on your tax, VAT or investments, help in the kitchen or drawing pretty pictures then this could be for you.

One point: as a dabbler in programming I would have liked the accompanying descriptive book to give listings of the programs. Still, with one hundred programs to list I suppose it is only natural they print that as a separate book at a separate charge.

**Fred Short**  
**Program 100 Programs for the Electron Price £11.50 Micro Electron Supplier** Prentice Hall International, London.

## Spectrum Programming

This combined book and cassette set in the Dr. Watson Computer Learning Series is sub-titled *Beginners Basic for the Spectrum*. But it falls between the two stools of getting the real beginner started and helping the more experienced programmer to go further.

The book gives its rationale as being to show how complete programs can be written, rather than duplicating the Spectrum manual's admirable cover of specific commands. While it is a worthwhile task, major disappointment about the set is that it spends far too much time going over ground already well dealt with in the ZX manual.

The book has thirteen chapters, twelve of which each develop an original idea for a game through to the finished program. This is where the tape provided can give you a shortcut, as it contains the final versions of the programs developed in these chapters. Although it may be a help to a reviewer hard pressed for time I do think it is more of a

gimmick than of much practical use. Most of the programs are simple enough to type in yourself.

The final game developed is an adventure game, and this is the only one long enough to justify the inclusion in the set of a pre-recorded tape. The unfortunate thing here was that I couldn't get it to work, as it first stopped with an error message referring to a non-existent line, and then tied my Spectrum into a knot. Switch off, and try again.

The book covers very little that isn't covered in the Spectrum manual, and it leaves out many of the micro's possibilities.

**Simon Springett**  
**Program/Book Spectrum Basic Programming Course Price £10.50 Micro Spectrum Supplier** Honeyfold Software, Standfast House, Bath Place, Barnet, London.

## Heathrow

Early in *Close Encounters of the Third Kind* a scene at Indiana Air Traffic Control in the unreal glow of radar screens shows tight-eyed men watching appalled as an unauthorised craft tracks through their airspace. To discover for yourself how they felt, spend a day peering at your VDU deciphering tiny white shapes on a screen — running *Heathrow*.



Being in charge of planes as they come in to land is like playing 3D chess while driving a dodgem car. Living under a flight path for Heathrow Airport did not help my nerves while I strained to learn the

skills of an Air Traffic Controller. Mike Male — the author of the program — is, however, a good teacher. He wrote this program based on his own job at the world's busiest airport.

This simulation takes several hours to come to terms with. There are — thank goodness — comprehensive sleeve notes with the cassette and the program has a 15 minute demonstration section running through a sequence of actions on screen while the notes explain what is happening.

There are several levels of activity in addition to the demonstration. Each gets progressively busier in the air and the last three include emergencies for you to panic about as the clock ticks steadily on. Thank goodness for a chance to freeze the program and relax — a luxury denied to the real controllers.

The program displays on request a page assessing your progress so far based on safety, handling of emergencies and the efficiency with which you get the craft down. It is important to funnel planes in as closely as possible to the real Heathrow's incredible 90 second average gap between landings.

This kind of program depends totally on the quality of screen display. *Heathrow* packs in three sections of information: radar screen, radio instructions and status board. Even with a monitor I found it hard to follow tiny aircraft on the blue radar screen — especially when the code letters they display look similar. Maybe this is why air-traffic controllers in movies tend to wear glasses.

As a veteran of several flight simulators on the BBC B, I expected to pick up *Heathrow* very easily. It is not that kind of program. Indeed there is nothing for the zap, bang instant response wizards in it. Even a nasty crash is unspectacular. But assuming you pay your good money to get the lasting satisfaction of a real challenge — then enjoy this one.

**Dave and Jan Watterson**  
**Program Heathrow Price £7.95 Micro BBC/Computer Supplier** Hewson Consultants, 56b Milton Trading Estate, Milton, Abingdon, Oxfordshire.




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## Quark, strangeness and charm

**Andrew Pennell** takes the first critical look at a production run Sinclair QL computer — one of the first machines to be received by a Sinclair customer earlier this month

The QL is here, and a few lucky people around the country now actually have one.

At the launch, some four months ago, the QL was hailed as the first of a new generation of home micros, with an amazing specification. Since then the worst delivery delays since the BBC micro have tarnished both the image of the computer and that of its designers, Sinclair. Now that the machine is in long last in production — the big question must be, is it worth the wait?

Although it's been published many times before, it is worth going through the

a blanking plate concealing a very large hole, called the expansion slot. Peering into this reveals a large 64-way socket, containing all the necessary hardware signals. Into this slot will plug any extra hardware, such as Ram packs, printer interfaces and disc controllers. If you want to plug more than one such item in at a time then you will have to get the QL Expansion Module, which is a sort of motherboard, but not yet available, but I think I saw some prototypes in Psion's labs during a visit not long ago. At the back of the case on the left is the Rom cartridge socket, originally intended to take up to 32K of external Rom. However, memory restric-

joystick in, you will have to fork out extra cash for a special adaptor. The cost and availability of this adaptor is, naturally, not known at this time. The type of socket used is mechanically the same as that found on the new British Telecom telephones, but electrically different.

Next to the joystick sockets are two RS232 ports, for the connection of most other peripherals such as printers or a modem. Unfortunately, most printers nowadays are Centronics or parallel connection types, so you will need an adaptor of some sort. Apparently a suitable interface will be available from Sinclair, but I



machine's basic specification again. It has 128K Ram, 40K Rom, a real keyboard, very high resolution graphics, and a pseudo 32-bit processor. As well as this, two Microdrives are included for mass storage, and four professional programs supplied by Psion. All for a paltry £400.

The machine doesn't really look that sophisticated from the outside. It is not very large or heavy and, once again, Sinclair has keys are non-standard, and the *Ctrl* key is where you would expect the *Shift* key. Also, it is a real pain to have to hold *Shift* together with "—" to obtain underline, which is a very important character on the QL being used as part of the syntax of many commands. To delete characters two keys have to be pressed, but as they are adjacent you soon get used to it.

It makes a change for a Sinclair machine to have a large number of sockets for various connections, even if most are non-standard. On the left of the keyboard is

tions forced the engineers to commandeer half of this space for the Basic, so the first customers have ugly little black boxes sticking out, containing some 8K of the Basic in Eprom (see *PCW*, April 26). When the final Roms are ready this "bodge-BASIC in Eprom (see *PCW*, April 26). When the final Roms are ready this "bodge-board" will not be necessary but, until that time, no other Rom cartridges can be plugged in. This unforeseen design modification has also meant that when the Eprom is incorporated into the main board it will still only be possible to plug in a maximum of 16K of Rom via the socket — half the intended amount.

Next to the Rom port along the back are two so-called joystick sockets. Instead of using the industry standard 9-pin D-type socket, as used by most joysticks, the designers deliberately chose a very unusual type of connector just to make life difficult. If you actually want to plug a

wouldn't recommend you hold your breath waiting for it.

There are also sockets for the domestic tv, black-and-white monitor and RGB colour monitor, at standard voltage levels, with an almost-standard socket.

There are also two network sockets, for connection to other QLs or Spectrums, and a blanked off extension Microdrive socket.

Lastly, at the front of the QL on the right are two small slots, into which the famous (or infamous) microdrive cartridges go. Opening the case revealed a surprisingly neat circuit board, with absolutely no modifications on it. Populating the board are fewer chips (excluding Ram) than in the ZX80 — two processors, 16 Ram chips, two custom ULAs, two Eproms and a few TTL chips.

On powering up the QL, you are greeted with a 1983 copyright message (showing just how late it is), together with a request to press function key *F1* or *F2*, depending on



which kind of display device you use.

If you are using a monitor, the screen is divided into 3 windows, with 80 characters per line. If you are using a TV, it changes into 40 character mode, with two of the windows superimposed. Each of the three 'windows' is a self-contained section of screen, each with independent position and attributes.

When you type in a line it appears in the five-line window at the bottom of the screen. Program listings appear in the top left, and printouts from programs which have been run appear on the top right windows. Unfortunately, if on power-up you choose the tv display option, rather than monitor, the list and print windows are displayed one on top of the other which makes things very confusing. I was not very impressed with the display quality on my own JVC telly, which was a bit fuzzy, and had the annoying habit of flicking to black-and-white.

The screen has two modes, either medium-or high-resolution. In medium-resolution there are eight colours available on screen, with hardware flashing. The resolution is 256x256 pixels, with none of the colour clash problems of the Spectrum or the serial attribute problems of the Oric. Unlike the Beeb, the fact that the screen uses a whopping 32K of RAM is not very significant, and it still leaves over 80K to the user.

In high-resolution mode, there are four-colours, at a resolution of 512 x 256 pixels. The full range of 32, 40, 64 or 80 characters per line are available, again in single- or double-height, but with no *Flash*.

Typing in Basic programs is not really as easy as it could have been, as the so-called syntax checker is awful. When you hit *Enter* after typing or editing a line, the machine checks the line for obvious mistakes, and if it finds one it rejects it with the message "bad line". Regrettably, there is no way of retrieving the bad line to edit the mistake — the whole thing has to be re-typed. It doesn't really syntax check anyway, so a line mistyped as

III PRINY A  
is accepted, as it assumes you could be about to define a procedure called PRINY. I prefer no syntax checking at all to the way the QL does it.

The Basic is one of the reasons for the long delay in finishing the machine, and is still the weak link in it. It originally had such a good specification that it all proved too difficult and time-consuming to complete. As a result, some of the commands referred to in the Provisional Manual have been dropped, while other easier-to-implement commands have been supplemented.

Superbasic itself initially proved tricky for me to use, as the sections of the manual describing it are not yet ready and the machine was sent out without a Basic manual.

It has all of the structured programming commands of the Beeb — namely *Repeat*, *Procedures*, multi-line functions, and a *Select* statement, an improvement over Pascal's *Case*. The best part of Superbasic is its graphics, which are mind-blowingly fast. It can plot points, draw arcs, circles and ellipses, pixel scroll parts in the screen in any direction, and fill shapes extremely quickly. Although the *Fill* algorithm is not very complex, it is very fast, and plotting off the screen no longer produces the annoying "Integer out of range" response — as on the Spectrum. There is also a *Recol* command, to simulate a colour palleties. To obtain more colours, the QL uses stippling, which are patterns of colours, to obtain different shades.

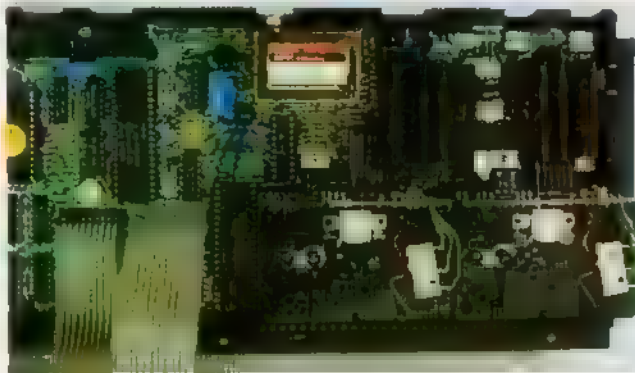
Curiously, there is no way of reading the colour pixels or characters from the screen (ie, *Point* and *Screen\$* on the Spectrum). The *Beep* command has many parameters, and good sound effects can be obtained. The output level is thankfully better than the Spectrums, but not as loud as the Beeb or the deafening Oric. Since there is no audio output socket on the QL, you can't pipe the sound through your monitor speaker, or any amplifier for that matter. Accessible using the *Dates* command is the internal clock. It not only stores

recognise external peripherals, such as disc drives, and that most machine-code on the QL has to be position independent. In addition, networking to a Spectrum proved to be almost impossible as the protocols do not seem the same.

As the QL uses one of the latest state-of-the-art processors, the 68008, I was expecting the Basic to be very fast. After running the standard benchmarks, however, I was rather disappointed, though it is thankfully faster the Spectrum. The QL is around one and a half times slower than the Beeb and the Amstrad, except when number crunching. Only one benchmark was faster, and it involved a lot of maths functions. It would appear that the priority when writing Superbasic was elegance.

After the changes, Superbasic is still good — if disappointingly slow. It has all the features of the previous best, namely BBC Basic (except the Assembler), with lots of additions. I personally mourn the demise of the *When* and *Trace* commands from the original QL spec though.

Most sceptics seem to think the weak link in the QL's design is its use of Microdrives, and I used to agree with them. However, QDOS handles them so cleverly that they are almost as good as true discs. Their



the time, but the day, month and year. Unfortunately, the value in the clock is not preserved when the power is removed. Nice features sorely missing from previous Sinclair dialects are integer variables, arrays starting at 0, *Auto*, *Renumber*, binary operations, double and quadruple *Peek* and *Poke*, and line delete.

A major QL feature is windowing, and works by defining different streams to different screen sections. Such 'windows' can be used to good effect, but are not up to concurrent CP/M or Lisa standard. One much advertised feature of the QL is multi-tasking, but this remains untested. As no technical information on QDOS — the QL microdrive operating system — is yet available, nothing can be said about it. The only known feature of QDOS is that it can

speed is faster than some disc systems, namely the notorious Apple and Commodore ones, and equals many others. Unlike the ZX variants, they can handle random-access. Only time will tell about reliability, but their predecessors, the ZX Spectrum ones, have now proved themselves, and my Microdrives are far more reliable than my Apple discs. As if to prove this, after typing half this review into my Apple the disc drive decided to crash, losing all my text, so I have re-typed it into my more reliable Spectrum with *Tasword*, and saved it on Microdrive. The Microdrive's only (easily curable) fault is the cartridge cost. Four pounds 95p is simply extortionate for 100K of media, and the price must come down.

The only problem I found with the QL



drives was the curious way in which the write-protect tab functioned. When writing to a protected cartridge, instead of getting an error, nothing happens. You are given the impression that your file was saved successfully, when in fact it wasn't.

For many, the major attraction of the QL is the four applications programs supplied with it, written by Psion. Each is supplied on a microdrive cartridge, and four blank cartridges are also supplied on which back-ups should immediately be made. The first part of the provisional manual says the *Exec* command should be used to load them, but it only results in the machine crashing. Further on in the manual the correct loading instructions are given, but the misprint is sure to cause a few customers to immediately return their QLs because "they won't load anything". The manual also says they take "a few

seconds" to load. In fact, the fastest any loaded in was a minute. Once loaded, the program cartridge always has to remain in Drive 1, with a formatted cartridge in Drive 2. This is because 128K Ram is insufficient, and they sometimes have to load in particular sections for some options. In addition, *Quill*, the word processor, also seems to use the second cartridge as some form of temporary storage. All the programs share a similar on-screen format, with helpful screen prompts, selectable character widths, and a *Help* facility available at any time by pressing function key F1.

Of the four programs, *Quill* will probably be the most useful to the average user. As world-processors on home micros go, it is almost certainly the best, though it does have some strange omissions. It uses the what-you-see-is-what-you-get principle, (or WYSIWYG), and performs all justification, margin setting and selection of type-faces while you type, very neatly. Changing any of the attributes is very easy using the prompts and you can change the number of characters per line to suit a TV or a monitor. Forty-column mode is useless on a tv, because you can't see the edges, while 64

is ideal, and 80 is fine for a monitor. There is a printer configure program on the *Quill* cartridge, with a limited choice of printers at the moment — either Epson FX80, or anything else. If you don't have an FX80 (or an RX80) then you have to define your printer control characters for different functions — in a similar way to *Tasword* on the Spectrum. I feel the major omission in *Quill* is the limited control characters you can send to your printer. The manual refers to a *View* facility that enables you to see very wide documents on the screen, but it seems to have been removed from the program without anybody telling the manual's author. Apart from QDOS problems that I shall mention later, the only bug I found was pressing *Esc* to terminate printing actually caused the machine to lock up — a bug that surely should have been corrected long ago.

*Easel* is the graphics package, which represents data in graphical form, using bar charts or pie charts. It is dead easy to use — you just type in your data (or import it from another of the four packages), and it immediately draws the graph. If you don't like the format chosen, it can be changed, though pie charts are very slow to draw. Assuming you have typed in your data and got the graph you want, what can you do with it? The easiest way is to get an image of it would seem to be to photograph the screen, and the manual tells you how best to go about it. The alternative is to dump the graph to your printer but, if you haven't got an Epson FX/RX 80 then too bad! Luckily I have an RX80 with RS232 card, so I was able to test the facility, and it works really well, if a little slow. Each screen colour is printed as a different shade, giving a very clear output. If you plotted your graph in 8-colour mode, it gets converted to 4-colour before printing.

*Abacus* is the spreadsheet, which the average user is likely to leave well alone, just as I did to start off. That's because you may think that they are only useful for financial forecasting. After reading the examples in the manual, though, you soon realise how useful a spreadsheet can be for all sorts of things. I used it to store

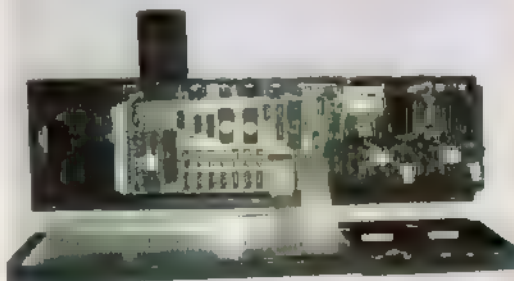
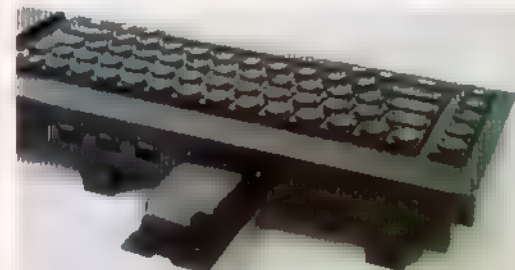
benchmark times for the QL and three others machines and then got it to calculate first the ratios between them all, and then the averages.

The most complicated of the four Psion programs is *Archive*, the database. It is similar, if not better than *Base 2*. Supplied with it is a demonstration file, containing a gazetteer of over 150 countries, which is a useful example. Simple use of *Archive* enables you to search for combinations of any attributes. For more complex uses, *Archive* supports a language similar to Basic, in which programs can be written to update and investigate any number of data files. Because of its sophistication it is not as easy to use as the other programs, but that is unavoidable.

I did experience alarming problems when doing certain input/output operations from all the applications, which leads me to think that there are still problems in QDOS. Files saved on cartridge often refused to completely load back, and the machine would just hang up in the middle of loading. It would also seem that Psion do not use as much of QDOS as they should.

In conclusion, the QL is pretty damn good. With a few modifications, though, it could have been superb. The machine and the applications programs together represent excellent value for money, but the Basic is a little disappointing. I hope when Sinclair upgrades Eprom customers it will take the opportunity to improve some of the Basic features, particularly the "syntax checker".

The good points of the QL far outweigh the bad, but it does have its disadvantages — a cartridge cost of £4.95 and problems of







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## 20

## Education special

PCW concludes the education series with a review of Commodore software, programs for use in secondary schools on the BBC, and a section on software for the disabled.

### It all adds up

David Lawrence looks at the latest education programs from Commodore

With a comparative hush hanging over the software market recently, one of the few areas that continues to attract attention and a great deal of investment is education. Most of the larger book publishers are heavily promoting ranges of educational programs and not to be outdone, Commodore have turned their attention to a new range of ideas for the 64. All the programs, as you would expect from the makers of the machine, show a good awareness of the 64's outstanding sound and graphics capabilities, though some show signs that they were rushed out when a little more thought could have improved them.

*Number Puzzler* is a case in point. Originally created by A.S.K., the title has been bought by Commodore and altered slightly for the 64.

Within one program are a set of extremely well worked out number games based on noughts and crosses or magic squares (where the lines, in any direction, add up to the same total). In the simplest noughts and crosses version, you are presented with a 3 x 3 grid of single digit numbers. Each of the two players (the 64 will play you if you want) is presented with two numbers that are either on the grid or can be added up to form a number on the grid. The player responds by saying whether the numbers are to be taken separately or added together. As a result, either one or two numbers on the grid are changed to the player's colour. When a player completes a line in his or her colour, that round of the game is over and when one player wins five rounds the game ends.

Tester Barny (aged seven) soon realised the need both to plan ahead and to ensure that the numbers were examined separately and when added together. In other words the game succeeded in making him think

and calculate, which is more than can be said of many. The 6 x 6 game, with numbers up to 99 involving addition and subtraction, would be a challenge for anyone.

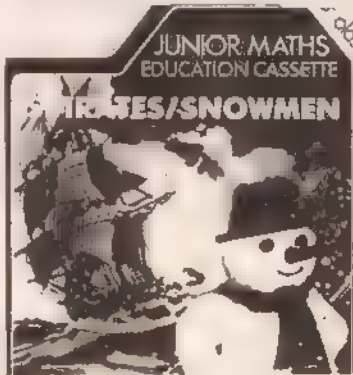
For all that, the program was marred by two features. Firstly, whenever one of the five forms was entered, it appeared impossible to return to the main menu. In other words, to access one of the other games, the tape had to be loaded again. Hardly an attractive feature at seven minutes a time. In fact, instructions for later games revealed that it was possible by use of the Control/B keys, but the omission of this from the instructions will spoil the package for many. The other flaw, common to many programs, is that programmers normally work on high quality monitors which are capable of doing justice to the range of colours the 64 produces. Not all domestic sets can, since colour bleeds from left to right on the screen, losing delicate shades on strong backgrounds. We found the change in colour in the numbers of one player, from white to light yellow on a brown background, almost impossible to distinguish. As a package, we enjoyed *Number Puzzler*, but as I say, I can't help thinking that a month later it might have been much more impressive.

*Spirates and Snowmen* was an immediate hit. Both the games are competitions for two players where success depends upon the ability to answer questions quickly and accurately. In all such games the success or otherwise of the idea depends upon how it is dressed up. In *Snowmen* you answer questions in the middle of a blizzard, and in

the time your question goes unanswered, your opponent's snowman grows. The game has 18 levels of play, nine for addition and nine for multiplication, allowing a fair balance to be struck between two players of almost any age group. *Spirates* doesn't have the same flexibility in terms of levels of play, but the scene is an enjoyable one nevertheless, with two pirate ships loosing off cannon balls at each other across the bay, with success depending upon quickness and accuracy in answering.

*Let's Count*, another ex-ASK package which consists of beginners' counting and number matching games set in such unlikely places as treasure islands, space stations and funfairs was excellent in every way. The graphics and sound were superb, with imaginative use of sprites throughout and the ideas, which seemed a little naive to me, intrigued Barny even though most were a little young for him. What impressed me most of all, however, was that at three and a half years old, tester Tom found the simpler games gripping and possible to play, a tribute to the range built in.

All in all, high marks for these first packages in the new series but I can't help thinking that Commodore's testing procedures need to be toughened up a little.



| Supplier                    | Game                        | Age  | Price |
|-----------------------------|-----------------------------|------|-------|
| Commodore Business Machines | <i>Number Puzzler</i>       | 5-11 | £4.99 |
| 675 Ajax Avenue             | <i>Spirates and Snowmen</i> | 5-11 | £4.99 |
| Slough Trading Estate       | <i>Let's Count</i>          | 5-11 | £9.99 |
| Slough                      | (two-cassette package)      |      |       |
| Berkshire                   |                             |      |       |

### Making faces

Keith and Steven Brain survey a selection for the 64 from independent publishers

Commodore have recently put a great deal of efforts into getting the Commodore 64 into schools so it is obviously interesting to see what sort of educational software is available.

*Fun to learn on the 64* from Shards Software is a compendium of five different educational games. This is a very long program and loading seems to take for

ever, thanks to the incredibly slow baud (or should read "baud"? rate of the Commodore cassette interface, but eventually you are requested to enter your name and a menu of six options puts a particular letter on the screen a variable number of times, and asks you to count how many copies are present. Obviously pretty basic stuff, but at least they have made it more useful by

telling you whether you were close or not, and rating your response time. Obviously pretty basic stuff, but at least they have made it more useful by telling you whether you were close or not, and rating your response time. There is a great temptation in the end to just guess rather than bothering to count! The whole package is well integrated so that there is ample opportunity to get back to the main menu when you tire of any particular game. None of the options are impressive in their own right, but put together on one tape they cover several different educational con-

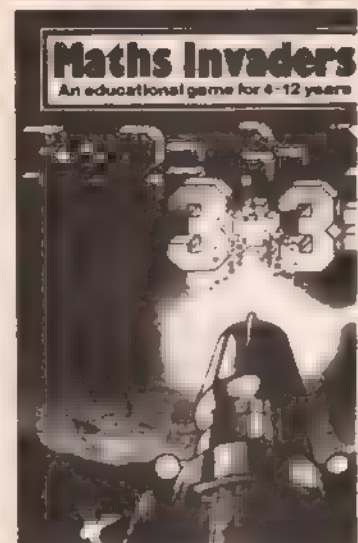
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# Education special

cepts and probably represent reasonable value for money.

*Identikit* from Stell is a very polished and entertaining affair from a company specialising in educational software. The game



revolves around building up faces on the screen in 'identikit' fashion from a selection of alternatives displayed on the screen. The first stage is to select a feature (eg, eyes) and then select a particular shape for this feature from the list provided. At the start of the program you can also call up a 'colour' option which allows you to specify any of 15 colours for each feature, as it is selected. Once the choice is made that feature slides smoothly across the screen into the appropriate position on the face.

Only two keys (spacebar and return) are

used by the face creation program, so that it is suitable for even the youngest child, and it is claimed that 15,000 different faces can be created (although we don't like the look of some of them!). Once a face has been created it can be animated so that it smiles, frowns, winks, wiggles its ears, or even moves everything at the same time with hilarious results. You can also choose to try a memory test which shows you a face for 30 seconds, and then allows you one minute to recreate the same face. It is billed as 'an entertaining introduction to the computer for 2-6 year olds' rather than making any particular educational claims, although it obviously teaches shape recognition and pattern matching. A very professional package.

*Maths Invaders* is another impressive program from Stell which combines arcade-style machine-code graphic action and sound with learning your maths. Rows of invaders containing maths questions (the ultimate weapon?) move down the screen in traditional style and you can only stop them by loading your gun with the correct answer and firing it at the corresponding alien. A mother ship scurries back and forth renewing the ranks and there are a total of three waves, each of 15 questions

in each game. Addition, subtraction, multiplication and division can be selected separately or in any combination, and you can even choose different skill levels for each type of question!

This certainly puts some fun into learning maths, but the complete absence of any method of scoring points is rather a disappointment. Successfully zapping all the answers just takes you back to the title page. Parents can stand the noise then the kids will certainly enjoy this way of learning.

*Typing Wizard* from Severn Software is rather different in that it is an undoubtedly educational but very serious aid to learning to type. An introduction to the system is provided and then there are six different lessons dealing with the various areas of the keyboard, a lesson dealing with the entire keyboard, and finally a speed test. An accurate picture of the keyboard and the position of your fingers is provided, together with a series of suitable exercises at each stage. The F7 key is used to step through the program (if you can find an eleventh finger). The ability to touch type is obviously useful and this well-designed package provides a painless way of developing the skill.

| Supplier   | Program                                   | Age     | Price          |
|--|---|---------|----------------|
| Shards Software<br>189 Eton Road<br>Ilford<br>Essex                    | <i>Fun to Learn on the 64</i>             | 6-12    | £8.95          |
| Stell Software<br>36 Limefield Avenue<br>Whalley<br>Lancashire BB6 9RJ | <i>Identikit</i><br><i>Maths Invaders</i> | 4-12    | £7.95<br>£7.95 |
| Severn Software<br>5 School Crescent<br>Lydney<br>Gloucestershire      | <i>Typing Wizard</i>                      | general | £8.50          |

## Down to business

**John Scriven discusses BBC software for use in secondary schools**

In the last review I looked at a selection of the software that was available for younger users of the BBC micro. This week I shall be looking at those packages designed for older users, although the boundary between these two groups is of course, very flexible.

There is more provision for programs that model computers in the real world than there used to be, but it is still an area that is to some degree lacking. There are database programs offered in both the primary and secondary MEP packs, and these are useful in many ways. If children build up their own databases of traffic surveys or census returns, they not only learn about databases but can also tackle subjects that

would be too complicated or time-consuming using traditional methods.

One of the more enterprising programs in this week's selection is *DBS*, a database package from MUSE. Anyone who is at all interested in educational computing would find joining MUSE (Micro Users in Secondary Education) an excellent investment, as the range of software they can supply covers most disciplines and all age ranges. They have 300 titles in their catalogue on cassette and disc, and these are written for ZX81s, Spectrums, 3802s, Apples and Pats, as well as BBC machines. MUSE also offer courses in different aspects of educational computing.

*DBS* is a full feature database program

that goes a lot further than *DBASE* in the MEP pack (which schools acquired along with their subsidised BBCs in the DES scheme in 1982 and 1983). *DBS* is split into several subprograms that are loaded from the disc as and when they are required. The menu program allows you to choose whether to initialise a new data file, edit or sort existing files or search for an entry. A 100K disc can contain about 400 records, each of up to eight fields of up to 25 characters. When you edit the file, you are allowed to add, delete, list, find or alter each record, and the display shows clearly the limits within which you can operate. Sorting allows you to choose the field, unlike some inferior programs, eg, if you were sorting names, addresses, towns and telephone numbers, you could sort in alphabetic order of names, or in order of the towns.

When it comes to searching the database, you can specify in great detail the requirements of the search. Using the previous example, you could ask to see all

the records that contain names beginning with A but not ending in S that live in London and Liverpool. Files can be stored in their new forms and the results can be sent to any parallel printer. The documentation is adequate, and the whole package would be useful in both the classroom and in administration.

The secondary programs from MUSE are also of a high standard, and include several written by Adrian Oldknow, including *Games* and *3D*. *Glass* is an elementary CAD program (computer aided design) that allows the user to design a drinking glass. Coordinates are entered on one side of a graph, and when the drawing mode is selected, the whole glass appears in three dimensions. The shape can then be altered by changing or adding other coordinates.

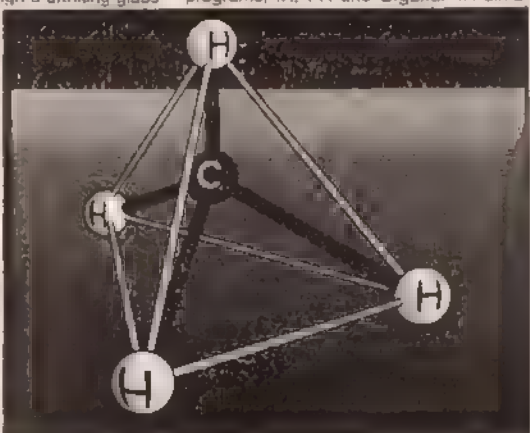
The second program, *3D*, also relies on graphics, and shows how a design can be rotated, reflected, enlarged, stretched, sheared and viewed from almost any angle. Objects to be viewed include a variety of polyhedrons and a house. As the program is menu-driven from a text window at the base of the screen, it is easy to see the effect of different commands in a way that would be impossible without a computer. My one complaint about the program is that there is no way to enter your own data for objects, partly due no doubt, to the limited amount of memory left by the BBC in high-resolution modes.

Although many ambitious science departments already use the BBC micro in experiments, there is some ready-made software available. *Pendulum* from MUSE allows the movement of a simple pendulum to be shown on the screen. The making of the pendulum is described in the detailed notes and this is attached to a potentiometer that is connected to turn to the A/D socket on the BBC. A graph of amplitude against time is drawn, and the length of the arm can be varied and the differences in frequency noted. This program would be ideal for both teachers and pupils coming to computers in control for the first time.

One area that seems well-off for software is that of chemistry. *Forensic* from MUSE applies basic chemical analysis to a murder enquiry. You are presented with four suspects, and you have to analyse substances found on their shoes. You can carry out flame tests, see what happens when you add hydrochloric acid, silver nitrate etc, as well as seeing the results of paper chromatography appear in front of you.

Safety is an important consideration in science, and the Health and Safety regulations now make it impossible to carry out many traditional experiments in the laboratory. This must be a good idea, as I remember with a certain amount of horror crowding round the front bench to watch oxygen burning in an atmosphere of hydrogen. Computers can come into their own in the field of simulations, and this fact is used by Acornsoft in some of their programs.

*Chemical Simulations* contains three programs, *IR*, *PH* and *Organel*. *IR* simu-



lates an infra-red spectrometer, and starts off by giving basic facts about IR spectra, including a table of the sort of peaks to be expected with different compounds. Next, a compound is selected at random, and its spectrum drawn.

*PH* plots titration curves between strong and weak acids and bases and also tests you on calculations through a series of multiple choice questions. The last program, *Organel*, is a detailed simulation of an organic analysis, and is similar to *Forensic*, but considerably more complex. There are three sections, basic reaction tests, revision of reactions, and the actual simulation. After being given an unknown compound,

you perform tests and the results are recorded in a laboratory notebook. You can check up on reactions at any time, and eventually enter your guess as to the identity of the compound. The documentation is first class, and includes pupils' notes.

Another set of simulations aimed at students comes from Hama software.

As an example, I have been looking at *Stock Control*, which consists of two cassettes and an accompanying booklet. The first program demonstrates the calculations necessary to make sure that you order a sufficient number of units without overstocking. Graphs of order size against cost are drawn, and the results of changing any of the parameters are instantly seen. Various factors such as cost of insurance, labour, material and spoilage need to be taken into consideration as well as transport and the cost of using up valuable storage space.

Running a business is shown to be far from simple, and the program offers a safe way to learn the ropes. (Computer bankruptcy is comparatively painless!) The second program enables the user to simulate seasonal variations in a similar program, and this is extended to cover a 48 week year. As well as giving a theoretical background to the problem, the documentation gives many examples and makes a complex subject reasonably comprehensible. The programs could even be given figures from a real life situation to provide the answers to "what if" questions that would usually only be available from spreadsheet programs. This type of business program is usually only available for business micros, which may explain the high price, but colleges may find the usefulness justifies the initial outlay.

This review has only covered a small selection of the software available for the BBC. I have avoided those programs such as *Adventures*, and logic games from *Connect Four* to *Chess*, which are far more "educational" than many bearing that title. It is clear that there is a move away from merely using the computer as a teaching machine, something to be admired.

| Supplier              | Program                     | Price  |
|-----------------------|-----------------------------|--------|
| Acornsoft             |                             |        |
| c/o Vector Marketing  | <i>Chemical Simulations</i> | £13.80 |
| Derington Estate      | <i>Chemical Structures</i>  | £13.80 |
| Wellingborough        |                             |        |
| Northants NN5 2RL     |                             |        |
| MUSE                  |                             |        |
| PO Box 43             | <i>DBS (disc)</i>           | £20.00 |
| Hull HU1 2HD          | <i>3D</i>                   | £10.00 |
|                       | <i>Glass</i>                | £10.00 |
|                       | <i>Pendulum</i>             | £7.00  |
|                       | <i>Forensic</i>             | £7.00  |
| HaMa Software         |                             |        |
| 44-48 Magdalen Street | <i>Calpac Twin Programs</i> |        |
| Norwich NR3 1JE       | <i>Stock Control</i>        | £43.00 |
|                       | <i>Network Analysis</i>     | £43.00 |
|                       | <i>Business Stats</i>       | £28.00 |

(Unless otherwise stated, all software is available on cassette, but disc versions are usually available.)



## Simply ingenious

**Robert Dawson scans a range of software and peripherals for the disabled**

Feeling rather spoilt for choice with this selection I started by loading the *Ega Beva Catalogue* and was shortly greeted with a very enthusiastic looking beaver wearing a mortar board and a toothy grin. The remainder of the tape contains a catalogue of the S.E.S.S. product range with price list and includes an overview, with aims, of each of the educational programs.

In an attempt to capture the interest of my wayward two and a half year old daughter I immediately went on to the *Snap* series, "for the pre-reading child". The object is to respond to a matching situation. *Colour Snap* has seven graded games that present a variety of coloured shapes in various combinations (carefully avoiding shape/colour association) with a reward presented for selecting a matching colour when it appears alongside.

In any educational situation the reward for correct learning and response must be totally appropriate. The blend of skills of the S.E.S.S. staff as teachers and programmers became apparent at once. The rewards to correct selections make full use of the BBC's sound, colour and graphics in the most delightfully entertaining way. Familiar nursery rhymes and popular tunes are associated with bold, colourful and easily identifiable pictures.

To make response easier for the younger or less able child who has not yet grasped the relationship in all the keys on the keyboard, all actions are entered by pressing the space bar. That being the largest and most obvious key available, this in itself is typical of the care running through the whole suite of programs.

My daughter was by now jumping up and down on my knee, thrilled by the dog wagging its tail (to the tune of "How Much Is That Doggy in the Window") and disappointed by the computer equivalent of a gentlemanly raspberry at her mistakes.

My next attempt to gain her interest in the screen and keyboard met with less success (due mainly to the jump in appreciation) but left me very impressed with what can be achieved using the BBC sound facilities. This cassette was the *Nursery Rhyme* collection.

I found the counter point harmony (or maybe it was descant) in *Twinkle Twinkle Little Star* quite captivating and I am sure that it will be a family bedtime favourite.

I would however level one of my few criticisms of the review at the loss of opportunity of having the words either changing colour, flashing or having a little dot marching along them as a cue.

To digress briefly, I recollect a "craze" at school for those plastic sliding block puzzles that had numbers or a picture on them.

*Ega Beva* have taken this principle and applied it with tremendous success to the computer screen in their *Sliding Block* and *Jigsaw Puzzles*. It starts by presenting a picture (or you can use one of your own creation) and then after you have had time to memorise it, splitting it up into a matrix, jumbling the pieces and blanking the bottom right hand corner. The dimensions of the matrix depend on the level that has been selected.

However, it is one of the most absorbing programs that I have come across and is much loved by handicapped children. Apparently, even mentally handicapped children will concentrate for nearly an hour (which is normally very difficult to achieve) to sort out the pieces and get the reward of a complete picture of a steam engine and a verse of "She'll Be Coming Round the Mountain When She Comes".

It encourages dialogue in groups of children, special awareness in the mentally handicapped and hand-eye coordination in the physically handicapped in manipulating the cursor control keys (or whatever device is used to replace them). It is a brilliant concept.

The *Abacus* program in the *Maths Pack* deserves a special mention. It is based on two big brightly coloured abaci with colour

coded beads. It teaches adding and subtracting by moving the beads from one to the other and prompting for a manual 'carry over' with the space bar.

The *Concept Keyboard* made by Star Microterminals Ltd is a data input keyboard which is widely used in educational establishments for the handicapped. It consists of an A4 sized wipe clean membrane with an 8 by 16 matrix of touch sensitive switches beneath it.

This matrix is totally software decoded within the computer and can represent anything from 128 ASCII coded keys down to one or two sensitive blocks of keys. This, with the appropriate overlays, makes it suitable for use by anybody with either the finest or the most gross of movements. An A3 sized keyboard is now available to increase the range of application.

The *Micro Mike* is basically a CB microphone with a small amplifier that plugs into the analogue to digital converter port on the BBC. That in itself is not outstanding but the software written to run with this is of the same quality and displays the same creative thought as the remainder of the *Ega Beva* range. The sight of a stalwart member of the medical profession lying on the floor and bellowing "GO, GO, GO" into the microphone to control his boat speeding up a rock infested river is testimony to the absorption that can be induced by this combination.

Simple fascination was the response to talking into the microphone and producing a city skyline on the screen formed from a speech volume-time graph in a variety of colours.

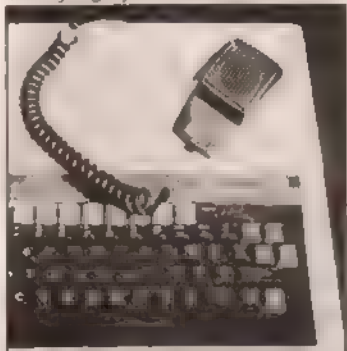
All of these voice operated games could be recommended for teaching coordination to people with speech impairment.

The *Utilities Pack* contains six useful routines that can be included in a variety of programs.

These include the routines to configure the BBC to operate with the *Concept Keyboard* and to interface the *Micro Mike*.

The *Micro Mike* and *Concept Keyboard* with their associated programs are a first class way of bringing educational entertainment to the physically or mentally handicapped child.

Overall, this is a suite of programs that would come in for a lot of use in any imaginative educational situation for the young or disabled.



The Micro Mike

| Supplier                         | Program                     | Age        | Price   |
|----------------------------------|-----------------------------|------------|---------|
| Ega Beva Software (S.E.S.S. Ltd) | <i>Colour Snap</i>          | pre-school | £11.95  |
| Central Trading Estate           | <i>Nursery Rhymes</i>       | pre-school | £9.95   |
| 275-277 Bath Road                | <i>Jigsaw Puzzle</i>        | primary    | £9.95   |
| Bristol                          | <i>Sliding Block Puzzle</i> | primary    | £9.95   |
| BS4 3EH                          | <i>Maths Pack</i>           | 5-11       | £11.95  |
|                                  | <i>Utilities Pack</i>       | general    | £7.95   |
| Star Microterminals              | <i>Concept Keyboard</i>     | general    |         |
| 22 Hyde Street                   | (A4)                        |            | £74.75  |
| Winchester                       | (A3)                        |            | £109.25 |
| Hants                            | (lead)                      |            | £9.20   |
| Ega Beva Software (S.E.S.S. Ltd) | <i>Micro Mike</i>           | general    | £28.75  |

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## Someone, somewhere

David Lawrence presents the first in a series of articles about networks and bulletin boards

Long distance communication exercises a fascination for human beings. From pen pals to amateur radio, there seems to be something irresistible about the idea of talking to people without seeing them face to face. Now, with the spread of the low cost micro, increasing numbers of people are discovering the fascination of a new form of communication known as "telephone networking", human beings talking to human beings through the medium of computers, or simply human beings talking to computers.

Next week I shall talk about some of the practical requirements that I have found, as a complete beginner, to be necessary to embark on networking. In this first article we shall take a look, not at the technicalities, but why people are talking via computers.

As I write this, it's Sunday afternoon in Oxford. Before I go any further I'm going to make up a little file on the word processor, consisting of the following:

"I'm writing a short article for *Popular Computing Weekly* on the joys of networking. This is a test of how quickly I can get responses to messages from around the country. Could anyone reading it please leave a short acknowledgement."

Having done that, I'll leave the article for a while, to make a few short phone calls — the time is 1340

### Intermission

It's now later in the day. Earlier, I spent about five minutes leaving the message in three different locations around the country, one in Liverpool and the other two in London.

Locations? Well, the country is increasingly dotted with either altruistic or just plain crazy people who run what are known as "Bulletin Boards" — computer systems which answer the phone and allow the machine at the other end to access their information or to send information. All of these are totally free to the users and allow them to leave private or public messages or to read the messages left by others.

If that sounds fairly dull, what it means is the opportunity to exchange information with a large number of people for the cost of one or two short phone calls — simply leave your message, either addressed to everyone or to a named individual, and you can get a response to most problems. To ensure that messages are seen by those who will be interested in them, most Bulletin Boards divide the messages that come in into "Special Interest Groups", covering the whole range from useful technical information on popular machines to one board in London which carries users' reviews of good places to eat.

The Bulletin Boards are simplicity itself to use, once you have the experience of a

couple of calls behind you. Having dialled the number and switched on the "modem" that allows your micro to communicate with the one at the other end of the line, it is as if someone is running a program on your machine. Menus appear on the screen, allowing you to make choices between the different facilities, like this one taken from a board in the London area (see Fig 1).

Not all networking concerns the amateur Bulletin Boards, however. With a decent modem and the right software, there are powerful systems like British Telecom's Prestel, with a host of facilities and local telephone numbers covering most of the country. Organisations like Micronet, which is accessed through Prestel, provide facilities specifically directed at micro owners at remarkably low cost. With every week that passes there is more at the end of a telephone line for those with a limited amount of equipment to play with.

Anyway, the time is now 2030, so it's time for me to phone around the three boards and see what the result of the message earlier was. In all, I have 11 replies, simple messages like Figure 2 which was left in the Liverpool Mailbox, and Figure 3 which came to me from London.

If I had asked a technical question there might not have been so many replies so quickly, but they would have come. That's the joy of telephone networking. My three calls cost me around 25p in total but if I left the messages on the three boards for a few days, that 25p would mean them being read by perhaps hundreds of people from all over the country. And even if they can't help, it's always nice just to hear from someone!

Figure 1

#### Bulletin Board Main Menu

```
<R>ead ... Read Msgs on TBBS board
<Q>uick-scan Msgs on TBBS board
<L>eave ... Leave Msg on TBBS board
<M>ail ... Electronic Mail Section
<S>IBS ... Special Interest Groups
<T>ime ... Elapsed Time
<G>oodbye ... Terminate Session
<I>nfo ... System Information
<D>ownload Programs
<U>pload ... Submit programs
<F>ormat ... Reconfigure terminal
<X>pert ... Change user level
<C>hat ... Talk to SYSOP
<P>assword .... Change your password
```

Command: g

Figure 2

```
Msg#: 4761 *TBBS*
04/29/84 16:21:47 (Read 1 Times)
From: WALT DAVIDSON
To: DAVID LAWRENCE
Subj: REPLY TO MSG# 4759 (NETWORKING)
Hi David. Read your message with interest
here in Swansea. Will look out for your
article. Regards, Walt (GW3NYY).
```

Figure 3

```
Msg#: 5380 *GENERAL*
04/29/84 17:32:53 (Read 2 Times)
From: DAN O'BRIEN
To: DAVID LAWRENCE
Subj: REPLY TO MSG# 5376 (NETWORKING)
Sure thing. An incredible one-hour
delay for a message from Cholesford, Essex
And they said it was just a puerile hobby...
```

Figure 4

```
Logged on at 23:46:14
Logged off at 23:53:27
```

Thanks for calling the Bulletin Board  
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## MIKRO-GEN



# Fast forward

Alan Turnbull explains how to speed up cassette loading

This article introduces two machine code routines for use on the 48K ZX Spectrum which enable the user to operate the cassette interface at a speed of approximately 4500 baud as opposed to the normal 1500 baud. The two routines are essentially copies of the SA-BYTES and LD-BYTES routines (see Ian Logan's *Spectrum Rom Disassembly*) found in the 16K Read Only Memory (Rom) but with certain 'timing constants' altered.

Figure 1 shows the relevant addresses in the Rom that have to be altered for various baud rates, whilst Figure 2 shows the two modified Rom routines, moved up into Ram and set up for 4500 baud.

The routines have been assembled, with the use of Hisoft's Devpac, in the 'expansion' Ram area of the Spectrum memory map at addresses 32768 onwards because of a technical detail which causes the malfunction of machine code routines

which rely on critical timing. Any such routine placed in the memory area 16384-32767 will fail to work correctly because the Ferranti Uncommitted Logic Array (ULA) interrupts the Z80 Central Processing unit (CPU) while it processes the video information.

For those readers ambitious enough, it should be possible to program a 128K (16K by 8 bit) Erasable Programmable Read Only Memory (Eprom) (for example, Intel 27128) to permanently provide a 4500 baud cassette interface, correct the existing errors in the Spectrum Rom and provide a few extra commands.

Figure 1

ADDRESSES OF LOCATIONS TO BE ALTERED IN THE  
ZX SPECTRUM ROM AND VALUES TO PROVIDE VARIOUS BAUD RATES  
FOR THE CASSETTE INTERFACE

| ADDRESS | 1500 BAUD | 3000 BAUD | 4500 BAUD |
|---------|-----------|-----------|-----------|
| 04F8    | 38        | 1E        | 14        |
| 0519    | 42        | 21        | 16        |
| 051F    | 3E        | 1F        | 15        |
| 052E    | 3E        | 19        | 10        |
| 05A6    | B0        | 58        | 38        |
| 05C7    | B2        | 59        | 3D        |
| 05CF    | CB        | 66        | 44        |
| 05D4    | B0        | 58        | 3D        |
| 05E8    | 16        | 0B        | 07        |

\*HIISOFT GENSYM ASSEMBLER\*  
ZX SPECTRUM

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Pass 1 errors: 00

```

10 * Machine-code routines for the
20 * 48K ZX Spectrum to provide a
30 * 4500 Baud cassette interface.
40 *
50 * Alan Turnbull 1984.
60 *
70 *
80 *
90 *
100 * 4500 BAUD SA-BYTES ROUTINE
110 *
120 * (IX) = START ADDRESS
130 * (DE) = LENGTH
140 * (A) = 0 = HEADER
150 * (A) = 255 = DATA
160 *
170 *

```

```

8000
8009 213F05 190 L04C2 ORG 32768
8003 E5 200 LD HL, #053F
8004 21801F 210 LD HL, #1F80
8007 C87F 220 BIT 7, A
8009 2803 230 JR L, L04D0
800B 21980C 240 LD HL, #0C99
800E 08 250 L04D0 EX AF, AF'
800F 13 260 INC DE
8010 DD2B 270 DEC IX
8012 F3 280 DI
8013 3E02 290 LD A, #02
8015 47 300 LD B, A
8016 10FE 310 L04D8 DJNZ L04D8
8018 D3FE 320 OUT (AF), A
801A EE0F 330 XOR #0F
801C 06A4 340 LD B, #A4
801E 2D 350 DEC L
801F 20F5 360 JR NZ, L04D8
8021 05 370 DEC B
8022 25 380 DEC H
8023 F21680 390 JP F, L04D8
8026 062F 400 LD B, #2F
8028 10FE 410 L04EA DJNZ L04EA

```

```

802A D3FE 420 OUT (0FE),A
802C 3E8D 430 LD A,00D
802E 0637 440 LD B,037
8030 10FE 450 L04F2 DJNZ L04F2
8032 03FE 460 OUT (0FE),A
8034 010E14 470 LD BC,0140E
8037 08 480 EX AF,AF
8039 6F 490 LD L,A
803B C34580 500 JP L0587
803C 7A 510 L04FE LD A,D
803E B3 520 OR E
803E 280C 530 JR 2,L050E
8040 DD6E80 540 LD L,(IX+0)
8043 7C 550 L0585 LD A,H
8044 AD 560 XOR L
8045 67 570 L0587 LD H,A
8046 3E81 580 LD A,001
8048 37 590 SCF
8049 C36380 600 JP L0525
804C 6C 610 L058E LD L,H
804D 18F4 620 JR L0505
804F 79 630 L0511 LD A,C
8050 CB78 640 BIT 7,B
8052 10FE 650 L0514 DJNZ L0514
8054 3004 660 JR NC,L051C
8056 0616 670 LD B,016
8058 10FE 680 L051A DJNZ L051A
805A D3FE 690 L051C OUT (0FE),A
805C 0615 700 LD B,015
805E 28EF 710 JR NZ,L0511
8060 05 720 DEC B
8061 AF 730 XOR A
8062 3C 740 INC A
8063 CB15 750 L0525 RL
8065 C25280 760 JP NZ,L0514
8068 1B 770 DEC DE
8069 DD23 780 INC IX
806B 0610 790 LD B,010
806D 3E7F 800 LD A,07F
806F 03FE 810 IN A,(0FE)
8071 1F 820 RRA
8072 00 830 RET NC
8073 7A 840 LD A,D
8074 3C 850 INC A
8075 C23C80 860 JP NZ,L04FE
8078 0638 870 LD B,038
807A 10FE 880 L053C DJNZ L053C
807C C9 890 RET

```

```

900 *
910 *
920 * 4500 BAUD LD_BYTES ROUTINE
930 *
940 * (IX) = START ADDRESS
950 * (DE) = LENGTH
960 * (A) = 0 = HEADER
970 * (A) = 255 = DATA
980 * CARRY RESET = VERIFY
990 * CARRY SET = LOAD
1000 *
1010 *
807D 14 1020 L0556 INC D
807E 08 1030 EX AF,AF
807F 15 1040 DEC D
8080 F3 1050 DI
8081 3E8F 1060 LD A,00F
8083 D3FE 1070 OUT (0FE),A
8085 213F05 1080 LD HL,0053F
8088 E5 1090 PUSH HL
8089 DBFE 1100 IN A,(0FE)
808B 1F 1110 RRA
808C E620 1120 AND 020
808E F682 1130 OR 002
8090 4F 1140 LD C,A
8091 BF 1150 CP A
8092 C8 1160 L0568 RET NZ

```

Pass 2 errors 00

Table used 385 from 588

```

8093 CD0E81 1170 L056C CALL L05E7
8096 30FA 1180 JR NC,L0568
8098 211584 1190 LD HL,00415
809B 10FE 1200 L0574 DJNZ L0574
809D 2B 1210 DEC HL
809E 7C 1220 LD A,H
809F B5 1230 OR L
80A0 28F9 1240 JR NZ,L0574
80A2 CD08A1 1250 CALL L05E3
80A5 30E8 1260 JR NC,L0568
80A7 069C 1270 L0580 LD B,09C
80A9 CD0A81 1280 CALL L05E3
80AC 30E4 1290 JR NC,L0568
80AE 3EC6 1300 LD A,0C6
80B0 B8 1310 CP B
80B1 30E0 1320 JR NC,L056C
80B3 24 1330 INC H
80B4 28F1 1340 JR NZ,L0580
80B6 86CA 1350 L058F LD B,0C9
80B8 CD0E81 1360 CALL L05E7
80BB 3005 1370 JR NC,L0568
80BD 78 1380 LD A,B
80BE FED4 1390 CP 0D4
80C0 30F4 1400 JR NC,L058F
80C2 CD0E81 1410 CALL L05E7
80C5 D0 1420 RET NC
80C6 79 1430 LD A,C
80C7 EE03 1440 XOR 003
80C9 4F 1450 LD C,A
80CA 2500 1460 LD H,000
80CC 0638 1470 LD B,038
80CE 181F 1480 JR L05C8
80D0 08 1490 L05A9 EX AF,AF
80D1 2807 1500 JR NZ,L05B3
80D3 300F 1510 JR NC,L058D
80D5 DD7500 1520 LD (IX+0),L
80D8 180F 1530 JR L05C2
80DA CB11 1540 L0583 RL
80DC AD 1550 XOR L
80DE C0 1560 RET NZ
80E0 79 1570 LD H,C
80E1 1F 1580 RRA
80E3 4F 1590 LD C,A
80E5 13 1600 INC DE
80E7 1807 1610 JR L05C4
80E9 DD7E00 1620 L058D LD A,(IX+0)
80EB AD 1630 XOR L
80ED C8 1640 RET NZ
80EF DD23 1650 L05C2 INC IX
80F0 18 1660 L05C4 DEC DE
80F2 08 1670 EX AF,AF
80F4 0638 1680 LD B,038
80F6 2E01 1690 L05C8 LD L,001
80F8 CD0A81 1700 L05CA CALL L05E3
80FA D0 1710 RET NC
80FB 3E44 1720 LD A,044
80FD B9 1730 CP B
80FF CB15 1740 RL
8101 0638 1750 LD B,038
8103 D2F180 1760 JP NC,L05CA
8105 7C 1770 LD A,H
8107 AD 1780 XOR L
8109 67 1790 LD H,A
810B 7A 1800 LD A,D
810D B3 1810 OR E
810F 28CA 1820 JR NZ,L05A9
8111 7C 1830 LD A,H
8113 FE01 1840 CP 001
8115 C9 1850 RET
8117 CD0E81 1860 L05E3 CALL L05E7
8119 D0 1870 RET NC
811B 3E07 1880 L05E7 LD A,007
811D 3D 1890 L05E9 DEC A
811F 28FD 1900 JR NZ,L05E9
8121 C3EC05 1910 JP 005EC

```



# Printing by numbers

Roger Walton presents a machine code graphics printer dump for an Epson printer

Anyone who uses a microcomputer for any "serious" purpose soon realises the benefits of having a printer. Hard-copy makes the development of programs much easier. People preparing for examinations in computing often have to provide printed examples of their work. The Dragon 32 provides the *Print #2* and *List* instructions for transfer of text to a printer, but these cannot be used for printing graphics. The following program provides a graphics dump which will print *PMode 4* graphics on an Epson printer.

Listing 1 gives a Basic program for the

dump routine. When loaded and run, this program stores a machine code subroutine at the top of user Ram. This routine may be called when necessary using *Exec &H7F30*. The graphics will be dumped to the printer in a matter of seconds. A similar program, written entirely in Basic, takes about 20 minutes.

Listing 2 gives the assembly language version of the program. This, together with the following tips, should make it clear how the program works and enable readers to adapt it to their own requirements.

The *Pmode 4* screen is arranged in 24

lines of 32 bytes per line. Thus the top, left-hand pixel is turned on by setting the msb (most-significant bit) of the relevant byte, which is *&H600*. The Epson printer uses 8 wires which are addressed vertically, the top wire corresponding to the msb. This means that each byte sent to the printer gives information about 8 pixels vertically above one another. The screen is read and printed in sections 8 lines deep, 1 bit at a time. When a full line has been read, the process repeats from the left-hand edge of the screen. In all, 24 sections must be read and printed.

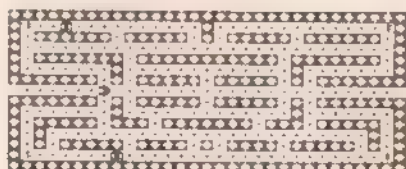
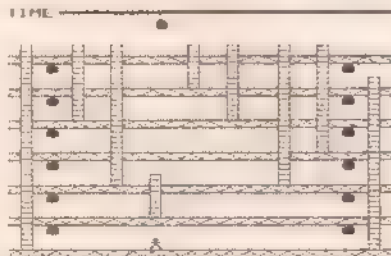
Sample printouts are included to illustrate the program in use.

## Listing 1

```

10 *****LISTING 1*****
20 ' Graphics dump for DRAGON
30 ' to Epson printer
40 ' dumps PMode 4 graphics
50 ' Tested using MX-80F/T
60 '
70 ' Roger Walton, Feb. 1984.
80 '
90 CLEAR 200,&H7F2F
100 FOR I=&H7F30 TO &H7FFF
110 READ A$
120 A$="2H"+A$
130 N=VAL(A$)
140 POKE I,N
150 T=T+N
160 NEXT
170 IF T>20978 THEN CLS:PRINT"DATA ERROR":STOP
180 END
190 DATA 20,08,12,12,12,12,12,12
200 DATA 12,12,86,18,8D,80,0F,86
210 DATA 40,8D,80,0F,86,18,8D,80
220 DATA 0F,86,41,8D,80,0F,86,08
230 DATA 8D,80,0F,86,0D,8D,80,0F
240 DATA 7F,7F,36,7F,7F,33,7F,7F
250 DATA 37,8E,06,00,8F,7F,38,7F
260 DATA 7F,32,86,18,8D,80,0F,86
270 DATA 48,8D,80,0F,86,0D,8D,80
280 DATA 0F,86,01,8D,80,0F,C6,8D
290 DATA F7,7F,33,86,8D,87,7F,36
300 DATA 8E,7F,38,7F,7F,34,A6,84
310 DATA 84,7F,33,8D,8D,30,8B,20
320 DATA 7C,7F,34,F6,7F,34,C1,08
330 DATA 25,EC,86,7F,37,8D,80,0F
340 DATA 7F,7F,37,F6,7F,33,54,F7
350 DATA 7F,33,C1,00,26,CD,8E,7F
360 DATA 38,30,01,8F,7F,38,7C,7F
370 DATA 32,86,7F,32,81,20,26,86
380 DATA 86,0A,8D,80,0F,8E,7F,38
390 DATA 30,89,00,EO,8F,7F,38,7C
400 DATA 7F,35,86,7F,33,81,18,26
410 DATA 86,39,34,06,81,00,27,0E
420 DATA 86,7F,36,F6,7F,36,FB,7F
430 DATA 37,F7,7F,37,20,03,86,7F
440 DATA 36,44,B7,7F,36,33,06,39

```



TIME END  
 100 = HIGH SCORE SCORE = 0  
 LEVEL = 1  
 LIVE = 000

### Listing 2

[illegible]



# COMMODORE 64

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| 2022 £4.50                 | Chess Master II £1.95         | Dark Dungeons II £3.95         | Warrior III £3.95        | SimCity III £14.95        | Word Perfect III £14.95        |
| Zorro £4.50                | Chess Master III £1.95        | Dark Dungeons III £3.95        | Warrior IV £3.95         | SimCity IV £14.95         | Word Perfect IV £14.95         |
| Star Wars £4.50            | Chess Master IV £1.95         | Dark Dungeons IV £3.95         | Warrior V £3.95          | SimCity V £14.95          | Word Perfect V £14.95          |
| Star Wars II £4.50         | Chess Master V £1.95          | Dark Dungeons V £3.95          | Warrior VI £3.95         | SimCity VI £14.95         | Word Perfect VI £14.95         |
| Star Wars III £4.50        | Chess Master VI £1.95         | Dark Dungeons VI £3.95         | Warrior VII £3.95        | SimCity VII £14.95        | Word Perfect VII £14.95        |
| Star Wars IV £4.50         | Chess Master VII £1.95        | Dark Dungeons VII £3.95        | Warrior VIII £3.95       | SimCity VIII £14.95       | Word Perfect VIII £14.95       |
| Star Wars V £4.50          | Chess Master VIII £1.95       | Dark Dungeons VIII £3.95       | Warrior IX £3.95         | SimCity IX £14.95         | Word Perfect IX £14.95         |
| Star Wars VI £4.50         | Chess Master IX £1.95         | Dark Dungeons IX £3.95         | Warrior X £3.95          | SimCity X £14.95          | Word Perfect X £14.95          |
| Star Wars VII £4.50        | Chess Master X £1.95          | Dark Dungeons X £3.95          | Warrior XI £3.95         | SimCity XI £14.95         | Word Perfect XI £14.95         |
| Star Wars VIII £4.50       | Chess Master XI £1.95         | Dark Dungeons XI £3.95         | Warrior XII £3.95        | SimCity XII £14.95        | Word Perfect XII £14.95        |
| Star Wars IX £4.50         | Chess Master XII £1.95        | Dark Dungeons XII £3.95        | Warrior XIII £3.95       | SimCity XIII £14.95       | Word Perfect XIII £14.95       |
| Star Wars X £4.50          | Chess Master XIII £1.95       | Dark Dungeons XIII £3.95       | Warrior XIV £3.95        | SimCity XIV £14.95        | Word Perfect XIV £14.95        |
| Star Wars XI £4.50         | Chess Master XIV £1.95        | Dark Dungeons XIV £3.95        | Warrior XV £3.95         | SimCity XV £14.95         | Word Perfect XV £14.95         |
| Star Wars XII £4.50        | Chess Master XV £1.95         | Dark Dungeons XV £3.95         | Warrior XVI £3.95        | SimCity XVI £14.95        | Word Perfect XVI £14.95        |
| Star Wars XIII £4.50       | Chess Master XVI £1.95        | Dark Dungeons XVI £3.95        | Warrior XVII £3.95       | SimCity XVII £14.95       | Word Perfect XVII £14.95       |
| Star Wars XIV £4.50        | Chess Master XVII £1.95       | Dark Dungeons XVII £3.95       | Warrior XVIII £3.95      | SimCity XVIII £14.95      | Word Perfect XVIII £14.95      |
| Star Wars XV £4.50         | Chess Master XVIII £1.95      | Dark Dungeons XVIII £3.95      | Warrior XIX £3.95        | SimCity XIX £14.95        | Word Perfect XIX £14.95        |
| Star Wars XVI £4.50        | Chess Master XIX £1.95        | Dark Dungeons XIX £3.95        | Warrior XX £3.95         | SimCity XX £14.95         | Word Perfect XX £14.95         |
| Star Wars XVII £4.50       | Chess Master XX £1.95         | Dark Dungeons XX £3.95         | Warrior XXI £3.95        | SimCity XXI £14.95        | Word Perfect XXI £14.95        |
| Star Wars XVIII £4.50      | Chess Master XXI £1.95        | Dark Dungeons XXI £3.95        | Warrior XXII £3.95       | SimCity XXII £14.95       | Word Perfect XXII £14.95       |
| Star Wars XIX £4.50        | Chess Master XXII £1.95       | Dark Dungeons XXII £3.95       | Warrior XXIII £3.95      | SimCity XXIII £14.95      | Word Perfect XXIII £14.95      |
| Star Wars XX £4.50         | Chess Master XXIII £1.95      | Dark Dungeons XXIII £3.95      | Warrior XXIV £3.95       | SimCity XXIV £14.95       | Word Perfect XXIV £14.95       |
| Star Wars XXI £4.50        | Chess Master XXIV £1.95       | Dark Dungeons XXIV £3.95       | Warrior XXV £3.95        | SimCity XXV £14.95        | Word Perfect XXV £14.95        |
| Star Wars XXII £4.50       | Chess Master XXV £1.95        | Dark Dungeons XXV £3.95        | Warrior XXVI £3.95       | SimCity XXVI £14.95       | Word Perfect XXVI £14.95       |
| Star Wars XXIII £4.50      | Chess Master XXVI £1.95       | Dark Dungeons XXVI £3.95       | Warrior XXVII £3.95      | SimCity XXVII £14.95      | Word Perfect XXVII £14.95      |
| Star Wars XXIV £4.50       | Chess Master XXVII £1.95      | Dark Dungeons XXVII £3.95      | Warrior XXVIII £3.95     | SimCity XXVIII £14.95     | Word Perfect XXVIII £14.95     |
| Star Wars XXV £4.50        | Chess Master XXVIII £1.95     | Dark Dungeons XXVIII £3.95     | Warrior XXIX £3.95       | SimCity XXIX £14.95       | Word Perfect XXIX £14.95       |
| Star Wars XXVI £4.50       | Chess Master XXIX £1.95       | Dark Dungeons XXIX £3.95       | Warrior XXX £3.95        | SimCity XXX £14.95        | Word Perfect XXX £14.95        |
| Star Wars XXVII £4.50      | Chess Master XXX £1.95        | Dark Dungeons XXX £3.95        | Warrior XXXI £3.95       | SimCity XXXI £14.95       | Word Perfect XXXI £14.95       |
| Star Wars XXVIII £4.50     | Chess Master XXXI £1.95       | Dark Dungeons XXXI £3.95       | Warrior XXXII £3.95      | SimCity XXXII £14.95      | Word Perfect XXXII £14.95      |
| Star Wars XXIX £4.50       | Chess Master XXXII £1.95      | Dark Dungeons XXXII £3.95      | Warrior XXXIII £3.95     | SimCity XXXIII £14.95     | Word Perfect XXXIII £14.95     |
| Star Wars XXX £4.50        | Chess Master XXXIII £1.95     | Dark Dungeons XXXIII £3.95     | Warrior XXXIV £3.95      | SimCity XXXIV £14.95      | Word Perfect XXXIV £14.95      |
| Star Wars XXXI £4.50       | Chess Master XXXIV £1.95      | Dark Dungeons XXXIV £3.95      | Warrior XXXV £3.95       | SimCity XXXV £14.95       | Word Perfect XXXV £14.95       |
| Star Wars XXXII £4.50      | Chess Master XXXV £1.95       | Dark Dungeons XXXV £3.95       | Warrior XXXVI £3.95      | SimCity XXXVI £14.95      | Word Perfect XXXVI £14.95      |
| Star Wars XXXIII £4.50     | Chess Master XXXVI £1.95      | Dark Dungeons XXXVI £3.95      | Warrior XXXVII £3.95     | SimCity XXXVII £14.95     | Word Perfect XXXVII £14.95     |
| Star Wars XXXIV £4.50      | Chess Master XXXVII £1.95     | Dark Dungeons XXXVII £3.95     | Warrior XXXVIII £3.95    | SimCity XXXVIII £14.95    | Word Perfect XXXVIII £14.95    |
| Star Wars XXXV £4.50       | Chess Master XXXVIII £1.95    | Dark Dungeons XXXVIII £3.95    | Warrior XXXIX £3.95      | SimCity XXXIX £14.95      | Word Perfect XXXIX £14.95      |
| Star Wars XXXVI £4.50      | Chess Master XXXIX £1.95      | Dark Dungeons XXXIX £3.95      | Warrior XL £3.95         | SimCity XL £14.95         | Word Perfect XL £14.95         |
| Star Wars XXXVII £4.50     | Chess Master XL £1.95         | Dark Dungeons XL £3.95         | Warrior XLI £3.95        | SimCity XLI £14.95        | Word Perfect XLI £14.95        |
| Star Wars XXXVIII £4.50    | Chess Master XLI £1.95        | Dark Dungeons XLI £3.95        | Warrior XLII £3.95       | SimCity XLII £14.95       | Word Perfect XLII £14.95       |
| Star Wars XXXIX £4.50      | Chess Master XLII £1.95       | Dark Dungeons XLII £3.95       | Warrior XLIII £3.95      | SimCity XLIII £14.95      | Word Perfect XLIII £14.95      |
| Star Wars XL £4.50         | Chess Master XLIII £1.95      | Dark Dungeons XLIII £3.95      | Warrior XLIV £3.95       | SimCity XLIV £14.95       | Word Perfect XLIV £14.95       |
| Star Wars XLI £4.50        | Chess Master XLIV £1.95       | Dark Dungeons XLIV £3.95       | Warrior XLV £3.95        | SimCity XLV £14.95        | Word Perfect XLV £14.95        |
| Star Wars XLII £4.50       | Chess Master XLV £1.95        | Dark Dungeons XLV £3.95        | Warrior XLVI £3.95       | SimCity XLVI £14.95       | Word Perfect XLVI £14.95       |
| Star Wars XLIII £4.50      | Chess Master XLVI £1.95       | Dark Dungeons XLVI £3.95       | Warrior XLVII £3.95      | SimCity XLVII £14.95      | Word Perfect XLVII £14.95      |
| Star Wars XLIV £4.50       | Chess Master XLVII £1.95      | Dark Dungeons XLVII £3.95      | Warrior XLVIII £3.95     | SimCity XLVIII £14.95     | Word Perfect XLVIII £14.95     |
| Star Wars XLV £4.50        | Chess Master XLVIII £1.95     | Dark Dungeons XLVIII £3.95     | Warrior XLIX £3.95       | SimCity XLIX £14.95       | Word Perfect XLIX £14.95       |
| Star Wars XLVI £4.50       | Chess Master XLIX £1.95       | Dark Dungeons XLIX £3.95       | Warrior L £3.95          | SimCity L £14.95          | Word Perfect L £14.95          |
| Star Wars XLVII £4.50      | Chess Master L £1.95          | Dark Dungeons L £3.95          | Warrior LI £3.95         | SimCity LI £14.95         | Word Perfect LI £14.95         |
| Star Wars XLVIII £4.50     | Chess Master LI £1.95         | Dark Dungeons LI £3.95         | Warrior LII £3.95        | SimCity LII £14.95        | Word Perfect LII £14.95        |
| Star Wars XLIX £4.50       | Chess Master LII £1.95        | Dark Dungeons LII £3.95        | Warrior LIII £3.95       | SimCity LIII £14.95       | Word Perfect LIII £14.95       |
| Star Wars L £4.50          | Chess Master LIII £1.95       | Dark Dungeons LIII £3.95       | Warrior LIV £3.95        | SimCity LIV £14.95        | Word Perfect LIV £14.95        |
| Star Wars LI £4.50         | Chess Master LIV £1.95        | Dark Dungeons LIV £3.95        | Warrior LV £3.95         | SimCity LV £14.95         | Word Perfect LV £14.95         |
| Star Wars LII £4.50        | Chess Master LV £1.95         | Dark Dungeons LV £3.95         | Warrior LVI £3.95        | SimCity LVI £14.95        | Word Perfect LVI £14.95        |
| Star Wars LIII £4.50       | Chess Master LVI £1.95        | Dark Dungeons LVI £3.95        | Warrior LVII £3.95       | SimCity LVII £14.95       | Word Perfect LVII £14.95       |
| Star Wars LIV £4.50        | Chess Master LVII £1.95       | Dark Dungeons LVII £3.95       | Warrior LVIII £3.95      | SimCity LVIII £14.95      | Word Perfect LVIII £14.95      |
| Star Wars LV £4.50         | Chess Master LVIII £1.95      | Dark Dungeons LVIII £3.95      | Warrior LIX £3.95        | SimCity LIX £14.95        | Word Perfect LIX £14.95        |
| Star Wars LVI £4.50        | Chess Master LIX £1.95        | Dark Dungeons LIX £3.95        | Warrior LX £3.95         | SimCity LX £14.95         | Word Perfect LX £14.95         |
| Star Wars LVII £4.50       | Chess Master LX £1.95         | Dark Dungeons LX £3.95         | Warrior LXI £3.95        | SimCity LXI £14.95        | Word Perfect LXI £14.95        |
| Star Wars LVIII £4.50      | Chess Master LXI £1.95        | Dark Dungeons LXI £3.95        | Warrior LXII £3.95       | SimCity LXII £14.95       | Word Perfect LXII £14.95       |
| Star Wars LIX £4.50        | Chess Master LXII £1.95       | Dark Dungeons LXII £3.95       | Warrior LXIII £3.95      | SimCity LXIII £14.95      | Word Perfect LXIII £14.95      |
| Star Wars LX £4.50         | Chess Master LXIII £1.95      | Dark Dungeons LXIII £3.95      | Warrior LXIV £3.95       | SimCity LXIV £14.95       | Word Perfect LXIV £14.95       |
| Star Wars LXI £4.50        | Chess Master LXIV £1.95       | Dark Dungeons LXIV £3.95       | Warrior LXV £3.95        | SimCity LXV £14.95        | Word Perfect LXV £14.95        |
| Star Wars LXII £4.50       | Chess Master LXV £1.95        | Dark Dungeons LXV £3.95        | Warrior LXVI £3.95       | SimCity LXVI £14.95       | Word Perfect LXVI £14.95       |
| Star Wars LXIII £4.50      | Chess Master LXVI £1.95       | Dark Dungeons LXVI £3.95       | Warrior LXVII £3.95      | SimCity LXVII £14.95      | Word Perfect LXVII £14.95      |
| Star Wars LXIV £4.50       | Chess Master LXVII £1.95      | Dark Dungeons LXVII £3.95      | Warrior LXVIII £3.95     | SimCity LXVIII £14.95     | Word Perfect LXVIII £14.95     |
| Star Wars LXV £4.50        | Chess Master LXVIII £1.95     | Dark Dungeons LXVIII £3.95     | Warrior LXIX £3.95       | SimCity LXIX £14.95       | Word Perfect LXIX £14.95       |
| Star Wars LXVI £4.50       | Chess Master LXIX £1.95       | Dark Dungeons LXIX £3.95       | Warrior LXX £3.95        | SimCity LXX £14.95        | Word Perfect LXX £14.95        |
| Star Wars LXVII £4.50      | Chess Master LXX £1.95        | Dark Dungeons LXX £3.95        | Warrior LXXI £3.95       | SimCity LXXI £14.95       | Word Perfect LXXI £14.95       |
| Star Wars LXVIII £4.50     | Chess Master LXXI £1.95       | Dark Dungeons LXXI £3.95       | Warrior LXXII £3.95      | SimCity LXXII £14.95      | Word Perfect LXXII £14.95      |
| Star Wars LXIX £4.50       | Chess Master LXXII £1.95      | Dark Dungeons LXXII £3.95      | Warrior LXXIII £3.95     | SimCity LXXIII £14.95     | Word Perfect LXXIII £14.95     |
| Star Wars LXX £4.50        | Chess Master LXXIII £1.95     | Dark Dungeons LXXIII £3.95     | Warrior LXXIV £3.95      | SimCity LXXIV £14.95      | Word Perfect LXXIV £14.95      |
| Star Wars LXXI £4.50       | Chess Master LXXIV £1.95      | Dark Dungeons LXXIV £3.95      | Warrior LXXV £3.95       | SimCity LXXV £14.95       | Word Perfect LXXV £14.95       |
| Star Wars LXXII £4.50      | Chess Master LXXV £1.95       | Dark Dungeons LXXV £3.95       | Warrior LXXVI £3.95      | SimCity LXXVI £14.95      | Word Perfect LXXVI £14.95      |
| Star Wars LXXIII £4.50     | Chess Master LXXVI £1.95      | Dark Dungeons LXXVI £3.95      | Warrior LXXVII £3.95     | SimCity LXXVII £14.95     | Word Perfect LXXVII £14.95     |
| Star Wars LXXIV £4.50      | Chess Master LXXVII £1.95     | Dark Dungeons LXXVII £3.95     | Warrior LXXVIII £3.95    | SimCity LXXVIII £14.95    | Word Perfect LXXVIII £14.95    |
| Star Wars LXXV £4.50       | Chess Master LXXVIII £1.95    | Dark Dungeons LXXVIII £3.95    | Warrior LXXIX £3.95      | SimCity LXXIX £14.95      | Word Perfect LXXIX £14.95      |
| Star Wars LXXVI £4.50      | Chess Master LXXIX £1.95      | Dark Dungeons LXXIX £3.95      | Warrior LXXX £3.95       | SimCity LXXX £14.95       | Word Perfect LXXX £14.95       |
| Star Wars LXXVII £4.50     | Chess Master LXXX £1.95       | Dark Dungeons LXXX £3.95       | Warrior LXXXI £3.95      | SimCity LXXXI £14.95      | Word Perfect LXXXI £14.95      |
| Star Wars LXXVIII £4.50    | Chess Master LXXXI £1.95      | Dark Dungeons LXXXI £3.95      | Warrior LXXXII £3.95     | SimCity LXXXII £14.95     | Word Perfect LXXXII £14.95     |
| Star Wars LXXIX £4.50      | Chess Master LXXXII £1.95     | Dark Dungeons LXXXII £3.95     | Warrior LXXXIII £3.95    | SimCity LXXXIII £14.95    | Word Perfect LXXXIII £14.95    |
| Star Wars LXXX £4.50       | Chess Master LXXXIII £1.95    | Dark Dungeons LXXXIII £3.95    | Warrior LXXXIV £3.95     | SimCity LXXXIV £14.95     | Word Perfect LXXXIV £14.95     |
| Star Wars LXXXI £4.50      | Chess Master LXXXIV £1.95     | Dark Dungeons LXXXIV £3.95     | Warrior LXXXV £3.95      | SimCity LXXXV £14.95      | Word Perfect LXXXV £14.95      |
| Star Wars LXXXII £4.50     | Chess Master LXXXV £1.95      | Dark Dungeons LXXXV £3.95      | Warrior LXXXVI £3.95     | SimCity LXXXVI £14.95     | Word Perfect LXXXVI £14.95     |
| Star Wars LXXXIII £4.50    | Chess Master LXXXVI £1.95     | Dark Dungeons LXXXVI £3.95     | Warrior LXXXVII £3.95    | SimCity LXXXVII £14.95    | Word Perfect LXXXVII £14.95    |
| Star Wars LXXXIV £4.50     | Chess Master LXXXVII £1.95    | Dark Dungeons LXXXVII £3.95    | Warrior LXXXVIII £3.95   | SimCity LXXXVIII £14.95   | Word Perfect LXXXVIII £14.95   |
| Star Wars LXXXV £4.50      | Chess Master LXXXVIII £1.95   | Dark Dungeons LXXXVIII £3.95   | Warrior LXXXIX £3.95     | SimCity LXXXIX £14.95     | Word Perfect LXXXIX £14.95     |
| Star Wars LXXXVI £4.50     | Chess Master LXXXIX £1.95     | Dark Dungeons LXXXIX £3.95     | Warrior LXXXX £3.95      | SimCity LXXXX £14.95      | Word Perfect LXXXX £14.95      |
| Star Wars LXXXVII £4.50    | Chess Master LXXXX £1.95      | Dark Dungeons LXXXX £3.95      | Warrior LXXXXI £3.95     | SimCity LXXXXI £14.95     | Word Perfect LXXXXI £14.95     |
| Star Wars LXXXVIII £4.50   | Chess Master LXXXXI £1.95     | Dark Dungeons LXXXXI £3.95     | Warrior LXXXXII £3.95    | SimCity LXXXXII £14.95    | Word Perfect LXXXXII £14.95    |
| Star Wars LXXXIX £4.50     | Chess Master LXXXXII £1.95    | Dark Dungeons LXXXXII £3.95    | Warrior LXXXXIII £3.95   | SimCity LXXXXIII £14.95   | Word Perfect LXXXXIII £14.95   |
| Star Wars LXXXX £4.50      | Chess Master LXXXXIII £1.95   | Dark Dungeons LXXXXIII £3.95   | Warrior LXXXXIV £3.95    | SimCity LXXXXIV £14.95    | Word Perfect LXXXXIV £14.95    |
| Star Wars LXXXXI £4.50     | Chess Master LXXXXIV £1.95    | Dark Dungeons LXXXXIV £3.95    | Warrior LXXXXV £3.95     | SimCity LXXXXV £14.95     | Word Perfect LXXXXV £14.95     |
| Star Wars LXXXXII £4.50    | Chess Master LXXXXV £1.95     | Dark Dungeons LXXXXV £3.95     | Warrior LXXXXVI £3.95    | SimCity LXXXXVI £14.95    | Word Perfect LXXXXVI £14.95    |
| Star Wars LXXXXIII £4.50   | Chess Master LXXXXVI £1.95    | Dark Dungeons LXXXXVI £3.95    | Warrior LXXXXVII £3.95   | SimCity LXXXXVII £14.95   | Word Perfect LXXXXVII £14.95   |
| Star Wars LXXXXIV £4.50    | Chess Master LXXXXVII £1.95   | Dark Dungeons LXXXXVII £3.95   | Warrior LXXXXVIII £3.95  | SimCity LXXXXVIII £14.95  | Word Perfect LXXXXVIII £14.95  |
| Star Wars LXXXXV £4.50     | Chess Master LXXXXVIII £1.95  | Dark Dungeons LXXXXVIII £3.95  | Warrior LXXXXIX £3.95    | SimCity LXXXXIX £14.95    | Word Perfect LXXXXIX £14.95    |
| Star Wars LXXXXVI £4.50    | Chess Master LXXXXIX £1.95    | Dark Dungeons LXXXXIX £3.95    | Warrior LXXXXX £3.95     | SimCity LXXXXX £14.95     | Word Perfect LXXXXX £14.95     |
| Star Wars LXXXXVII £4.50   | Chess Master LXXXXX £1.95     | Dark Dungeons LXXXXX £3.95     | Warrior LXXXXXI £3.95    | SimCity LXXXXXI £14.95    | Word Perfect LXXXXXI £14.95    |
| Star Wars LXXXXVIII £4.50  | Chess Master LXXXXXI £1.95    | Dark Dungeons LXXXXXI £3.95    | Warrior LXXXXXII £3.95   | SimCity LXXXXXII £14.95   | Word Perfect LXXXXXII £14.95   |
| Star Wars LXXXXIX £4.50    | Chess Master LXXXXXII £1.95   | Dark Dungeons LXXXXXII £3.95   | Warrior LXXXXXIII £3.95  | SimCity LXXXXXIII £14.95  | Word Perfect LXXXXXIII £14.95  |
| Star Wars LXXXXX £4.50     | Chess Master LXXXXXIII £1.95  | Dark Dungeons LXXXXXIII £3.95  | Warrior LXXXXXIV £3.95   | SimCity LXXXXXIV £14.95   | Word Perfect LXXXXXIV £14.95   |
| Star Wars LXXXXXI £4.50    | Chess Master LXXXXXIV £1.95   | Dark Dungeons LXXXXXIV £3.95   | Warrior LXXXXXV £3.95    | SimCity LXXXXXV £14.95    | Word Perfect LXXXXXV £14.95    |
| Star Wars LXXXXXII £4.50   | Chess Master LXXXXXV £1.95    | Dark Dungeons LXXXXXV £3.95    | Warrior LXXXXXVI £3.95   | SimCity LXXXXXVI £14.95   | Word Perfect LXXXXXVI £14.95   |
| Star Wars LXXXXXIII £4.50  | Chess Master LXXXXXVI £1.95   | Dark Dungeons LXXXXXVI £3.95   | Warrior LXXXXXVII £3.95  | SimCity LXXXXXVII £14.95  | Word Perfect LXXXXXVII £14.95  |
| Star Wars LXXXXXIV £4.50   | Chess Master LXXXXXVII £1.95  | Dark Dungeons LXXXXXVII £3.95  | Warrior LXXXXXVIII £3.95 | SimCity LXXXXXVIII £14.95 | Word Perfect LXXXXXVIII £14.95 |
| Star Wars LXXXXXV £4.50    | Chess Master LXXXXXVIII £1.95 | Dark Dungeons LXXXXXVIII £3.95 | Warrior LXXXXXIX £3.95   | SimCity LXXXXXIX £14.95   | Word Perfect LXXXXXIX £14.95   |
| Star Wars LXXXXXVI £4.50   | Chess Master LXXXXXIX £1.95   | Dark Dungeons LXXXXXIX £3.95   | Warrior LXXXXXX £3.95    | SimCity LXXXXXX £14.95    | Word Perfect LXXXXXX £14.95    |
| Star Wars LXXXXXVII £4.50  | Chess Master LXXXXXX £1.95    | Dark Dungeons LXXXXXX £3.95    | Warrior LXXXXXI £3.95    | SimCity LXXXXXI £14.95    | Word Perfect LXXXXXI £14.95    |
| Star Wars LXXXXXVIII £4.50 | Chess Master LXXXXXI £1.95    | Dark Dungeons LXXXXXI £3.95    | Warrior LXXXXXII £3.95   | SimCity LXXXXXII £14.95   | Word Perfect LXXXXXII £14.95   |
| Star Wars LXXXXXIX £4.50   | Chess Master LXXXXXII £1.95   | Dark Dungeons LXXXXXII £3.95   | Warrior LXXXXXIII £3.95  | SimCity LXXXXXIII £14.95  | Word Perfect LXXXXXIII £14.95  |
| Star Wars LXXXXX £4.50     | Chess Master LXXXXXIII £1.95  | Dark Dungeons LXXXXXIII £3.95  | Warrior LXXXXXIV £3.95   | SimCity LXXXXXIV £14.95   | Word Perfect LXXXXXIV £14.95   |
| Star Wars LXXXXXI £4.50    | Chess Master LXXXXXIV £1.95   | Dark Dungeons LXXXXXIV £3.95   | Warrior LXXXXXV £3.95    | SimCity LXXXXXV £14.95    | Word Perfect LXXXXXV £14.95    |
| Star Wars LXXXXXII £4.50   | Chess Master LXXXXXV £1.95    | Dark Dungeons LXXXXXV £3.95    | Warrior LXXXXXVI £3.95   | SimCity LXXXXXVI £14.95   | Word Perfect LXXXXXVI £14.95   |
| Star Wars LXXXXXIII £4.50  | Chess Master LXXXXXVI £1.95   | Dark Dungeons LXXXXXVI £3.95   | Warrior LXXXXXVII £3.95  | SimCity LXXXXXVII £14.95  | Word Perfect LXXXXXVII £14.95  |
| Star Wars LXXXXXIV £4.50   | Chess Master LXXXXXVII £1.95  | Dark Dungeons LXXXXXVII £3.95  | Warrior LXXXXXVIII £3.95 | SimCity LXXXXXVIII £14.95 | Word Perfect LXXXXXVIII £14.95 |
| Star Wars LXXXXXV £4.50    | Chess Master LXXXXXVIII £1.95 | Dark Dungeons LXXXXXVIII £3.95 | Warrior LXXXXXIX £3.95   | SimCity LXXXXXIX £14.95   | Word Perfect LXXXXXIX £14.95   |
| Star Wars LXXXXXVI £4.50   | Chess Master LXXXXXIX £1.95   | Dark Dungeons LXXXXXIX £3.95   | Warrior LXXXXXX £3.95    | SimCity LXXXXXX £14.95    | Word Perfect LXXXXXX £14.95    |
| Star Wars LXXXXXVII £4.50  | Chess Master LXXXXXX £1.95    | Dark Dungeons LXXXXXX £3.95    | Warrior LXXXXXI £3.95    | SimCity LXXXXXI £14.95    | Word Perfect LXXXXXI £14.95    |
| Star Wars LXXXXXVIII £4.50 | Chess Master LXXXXXI £1.95    | Dark Dungeons LXXXXXI £3.95    | Warrior LXXXXXII £3.95   | SimCity LXXXXXII £14.95   | Word Perfect LXXXXXII £14.95   |
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# Between the lines

Adrian Warman looks inside the SID chip and explains how to Peek some of the registers

The Commodore 64 home computer has a device called SID (Sound Interface Device), which is used for providing sound effects, as well as obtaining paddle information. There are 29 registers within the SID, of which the first 25 are of greatest interest to programmers. These registers are divided into four groups:

- a) Registers controlling Voice 1
- b) Registers controlling Voice 2
- c) Registers controlling Voice 3
- d) Registers controlling Resonance, Filtering and the Master Volume

Unfortunately, all these registers are designated as 'write-only' (the exact opposite of 'read-only'). This means that whenever you *Poke* data to one of these registers, it is accepted without difficulty — but if you attempt to *Peek* any of the registers, you will always get the value '0' returned, regardless of the actual contents of that register. Thus, 'reading' the registers has no effect.

There are a variety of ways of overcoming this problem. Using Basic for example, it would be possible to keep a 'master copy' of all the registers in an array (say, SID) — then, whenever information is transferred to a SID register, the corresponding element in the array is also updated. Unfortunately, this takes time, particularly when using the large numbers of *Pokes* required to program SID.

Adept machine-code programmers could write a routine to transfer data to a specified register, and at the same time update a copy of that register. Less experienced programmers, however, would find this more difficult. This program provides a simple and fast routine to do the job, and combines the capability and speed of machine code with the inherent simplicity of normal SID use. Normally, when programming SID from Basic, *Pokes* are used in locations 54272 to 54296.

This program provides an alternative area of Ram from \$C047 to \$C05F, which behaves as an exact copy of SID. *Pokes* made into this area will have precisely the same effect as corresponding *Pokes* into the genuine SID area. The advantage is that being Ram, *Peeking* these locations will return the current contents of the appropriate SID register.

The program works by altering the *irq* activities. The routine simply copies the contents of the SID copy area into the SID itself. This updating occurs once every 60th of a second, and is completely transparent to the user.

To use the program, simply load and run the supplied Basic loader program. The program is then installed in the Ram from \$C000 onwards. To activate the copy

routine, use the instruction:  
SYS 49152

Although no apparent effect will be observed (ie. the computer simply returns with the 'Ready' message), the *irq* vector has now been modified. Any subsequent *Pokes* to the SID copy area will perform exactly as if the *Poke* had been made to the SID itself. Note that at any time, you can use the same command to entirely reset all registers within the SID chip, since this routine automatically clears all the copy locations to zero.

| Hex  | Decimal | Function                            | Normal SID location |
|------|---------|-------------------------------------|---------------------|
| C047 | 49223   | Freq $\square$ Voice 1              | 54272               |
| C048 | 49224   | Freq H                              | 54273               |
| C049 | 49225   | Pulse L                             | 54274               |
| C04A | 49226   | Pulse $\square$                     | 54275               |
| C04B | 49227   | Control                             | 54276               |
| C04C | 49228   | Attack/Decay                        | 54277               |
| C04D | 49229   | Sustain/Release                     | 54278               |
| C04E | 49230   | As voice 1, but for voice $\square$ | 54279               |
| C054 | 49236   |                                     | 54285               |
| C055 | 49238   | As voice 1, but for voice 3         | 54286               |
| C05B | 49243   |                                     | 54292               |
| C05C | 49244   | Filter Cutoff L                     | 54293               |
| C05D | 49245   | Filter Cutoff H                     | 54294               |
| C05E | 49246   | Resonance                           | 54295               |
| C05F | 49247   | Modes Master Volume                 | 54296               |

To disable the copying process, simply perform a warm start (ie. *Run/Stop-Restore*). You will find the table below useful.

## Notes

(Please refer to the Assembly listing while reading these details).

1210-1260

This section will alter the *irq* vector. However, a check is made to see if the vector already points to the copy routine. If so, no modification is necessary.

1350-1440

The *irq* vector was found not to point to the copy routine, so this section of code alters the vector appropriately. Note that the old *irq* vector is preserved, and when the copying process has been completed, the CPU jumps using the old *irq* vector that was found.

1540-1590

Having modified the *irq* vector (or not), these lines ensure that the SID copy area is blank, and has no garbage bytes in it. Note that whenever this routine is run, the SID chip will be reset because all the zeroes will be copied across upon the next interrupt.

1700-1830

The copy routine itself. First (all), the A, P and Y registers are preserved, since they will be modified during the copying. This precaution is very important, since interrupt information is probably contained within the registers. After preserving the registers, the SID copy area is duplicated into the SID chip itself (lines 1740-1790). The registers are then restored back to their original values, ready to enter the normal *irq* routine.

Note that in the Assembly listing, it appears that the chip will perform an *irq* jump to location \$0000 (line 1830). In fact, this address will be altered when the *irq* vector is changed (lines 1370 and 1410).

## 1000 REM BASIC LOADER FOR SID-COPY PROGRAM.

1010 :

1020 REM BY A. WARMAN

1030 :

1040 ADDRESS=49152

1050 SUM=0

1060 :

1070 FOR LOC=ADDRESS TO ADDRESS+95

1080 READ DATUM

1090 POKE LOC, DATUM

1100 SUM=SUM+DATUM

1110 NEXT LOC

1120 :

1130 IF SUM<>7288 THEN PRINT "SUM ERROR."

1140 STOP

1150 :

1160 DATA 173, 20, 3, 201, 49, 208, 7, 173

1170 DATA 21, 3, 201, 192, 240, 24, 120, 173

1180 DATA 20, 3, 141, 69, 192, 169, 49, 141

1190 DATA 20, 3, 173, 21, 3, 141, 70, 192

1200 DATA 169, 192, 141, 21, 3, 88, 160, 24

1210 DATA 169, 0, 153, 71, 192, 136, 16, 230

1220 DATA 96, 72, 8, 152, 72, 160, 24, 185

1230 DATA 71, 192, 153, 0, 212, 136, 16, 247

1240 DATA 104, 168, 40, 104, 76, 0, 0, 0

1250 DATA 0, 0, 0, 0, 0, 0, 0, 0

1260 DATA 0, 0, 0, 0, 0, 0, 0, 0

1270 DATA 0, 0, 0, 0, 0, 0, 0, 0

```

1000 C000      **$C000
1010 C000      :
1020 C000      : SID ASSIST PROGRAM.
1030 C000      :
1040 C000      : BY A.WARNAN
1050 C000      :
1060 C000      : PROVIDES AN AREA IN NORMAL RAM
1070 C000      : WHICH IS COPIED DURING A SYSTEM
1080 C000      : IRQ INTO THE SID REGISTERS. THIS
1090 C000      : MEANS THAT THE CURRENT SID REGISTER
1100 C000      : VALUES CAN BE READ FROM THE RAM.
1110 C000      :
1120 C000      : SID          = $D400
1130 C000      :
1140 C000      : MODIFY THE IRQ VECTOR TO PERFORM THE
1150 C000      : ADDITIONAL TASK. A CHECK IS MADE TO
1160 C000      : ESTABLISH WHETHER THE IRQ VECTOR IS
1170 C000      : ALREADY POINTING TO THE COPY ROUTINE,
1180 C000      : AND IF SO, THE VECTOR WILL NOT BE
1190 C000      : ALTERED.
1200 C000      :
1210 C000 AD1403 REDIRECT   LDA $0314
1220 C003 C931             CMP $UPDATE
1230 C005 D007             BNE MODIFY
1240 C007 AD1503           LDA $0315
1250 C00A C9C9             CMP $UPDATE
1260 C00C F018             BEQ EXIT
1270 C00E
1280 C00E      : THE IRQ VECTOR IS NOT POINTING TO THE
1290 C00E      : COPY ROUTINE, SO MODIFY.
1300 C00E      : NOTE THAT THE OLD IRQ VECTOR IS COPIED
1310 C00E      : TO THE END OF THE ROUTINE, SO THAT
1320 C00E      : ANY PRIOR MODIFICATIONS TO IRQ VECTOR
1330 C00E      : WILL NOT BE 'DAMAGED'.
1340 C00E      :
1350 C00E 78             MODIFY   BEI
1360 C00F AD1403           LDA $0314
1370 C012 BD45C0           STA IRQEXIT+1
1380 C015 A931             LDA $UPDATE
1390 C017 BD1403           STA $0314
1400 C01A AD1503           LDA $0315
1410 C01D BD46C0           STA IRQEXIT+2
1420 C020 A9C0             LDA $UPDATE
1430 C022 BD1503           STA $0315
1440 C025 58             CLI
1450 C026
1460 C026      : HAVING COMPLETED ANY NECESSARY CHANGES
1470 C026      : TO THE IRQ VECTOR, THE COPY OF THE
1480 C026      : SID REGISTERS IS RESET TO ZERO.
1490 C026      : THIS HAS THE ADDITIONAL ADVANTAGE THAT
1500 C026      : AT ANY TIME, RERUNNING THE REDIRECT
1510 C026      : PROGRAM WILL 'SWITCH OFF' ANY SOUND
1520 C026      : CURRENTLY PRODUCED BY THE SID.
1530 C026      :
1540 C026 A018           EXIT     LDY $018
1550 C028 A900           LDA $000
1560 C02A 9947C0 CLRCOPY   STA SIDCOPY,Y
1570 C02D B8             DEY
1580 C02E 10FA           BPL CLRCOPY
1590 C030 60             RTS
1600 C031
1610 C031
1620 C031      : THE IRQ VECTOR POINTS TO THIS ROUTINE.
1630 C031      : THE A,P AND Y REGISTERS ARE PRESERVED
1640 C031      : ON THE STACK. THE INFORMATION IN THE
1650 C031      : COPY OF SID IS COPIED ACROSS TO THE
1660 C031      : SID LOCATIONS. THE A,P AND Y REGISTERS
1670 C031      : ARE THEN RESTORED BEFORE JUMPING TO
1680 C031      : THE NORMAL IRQ ROUTINE.
1690 C031      :
1700 C031 48             UPDATE   PHA
1710 C032 08             PHP
1720 C033 98             TYA
1730 C034 48             PHA
1740 C035 A018           LDY $018
1750 C037 B947C0 COPYLOOP  LDA SIDCOPY,Y
1760 C03A 9900D4           STA SID,Y
1770 C03D B8             DEY

```



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```

1780 C03E 10F7      SPL COPYLOOP
1790 C040 68        PLA
1800 C041 A8        TAY
1810 C042 28        PLP
1820 C043 68        PLA
1830 C044 4C0000 18DEXIT JMP $0000
1840 C047
1850 C047
1860 C047          AREA THAT CONTAINS VALUES TL BE COPIED
1870 C047          INTO SID.
1880 C047
1890 C047 0000  SIDCOPY  WOR $0000      FREQ V1
1900 C049 0000      WOR $0000      PW V1
1910 C04B 00        BYT $00        CONTROL V1
1920 C04C 00        BYT $00        A/D V1
1930 C04D 00        BYT $00        S/R V1
1940 C04E
1950 C04E 0000      WOR $0000      FREQ V2
1960 C050 0000      WOR $0000      PW V2
1970 C052 00        BYT $00      CONTROL V2
1980 C053 00        BYT $00      A/D V2
1990 C054 00        BYT $00      S/R V2
2000 C055
2010 C055 0000      WOR $0000      FREQ V3
2020 C057 0000      WOR $0000      PW V3
2030 C059 00        BYT $00      CONTROL V3
2040 C05A 00        BYT $00      A/D V3
2050 C05B 00        BYT $00      S/R V3
2060 C05C
2070 C05C 0000      WOR $0000      FILTER
2080 C05E 00        BYT $00      RES/FILT
2090 C05F 00        BYT $00      MODE/VOL

C02A CLRCOPY      C037 COPYLOOP      C026 EXIT      C044 18DEXIT
C00E MODIFY      C000 REDIRECT      D400 SID      C047 SIDCOPY
C031 UPDATE

```

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## Designer

on Spectrum

This program is for any Sinclair ZX Spectrum and enables the user to make complicated screen displays. The keys which are used are explained in the program. Be careful when using draw. If the draw statement is out of range you will lose your picture unless you either *goto* the next line

number or press *continue*. The program also enables you to define your own graphics by pressing 'C'. You are then asked which graphic is to be defined, you respond and put in the graphic numbers, one row at a time. You are also able to *Save* the present screen string which you are working on. You can *Load* it back and you are also able to *Load* pre-defined graphics which you have *Saved* from the *Horizons* Character Generator.

The program is written entirely in Basic and parts of the program could, if you wanted to, be converted in to machine code. Although in Basic it is very fast at processing your command.

### Program notes

|           |   |
|-----------|---|
| 10        | Subroutine for introduction                             |
| 20-100    | Subroutine for user to communicate through computer     |
| 110-235   | Subroutine to place text on screen                      |
| 300-540   | Subroutine to choose defined graphic.                   |
| 550-750   | Subroutine to print graphic on screen and to colour it. |
| 760-850   | Subroutine to Draw and to plot on screen.               |
| 900-980   | Subroutine to define characters.                        |
| 9900-9450 | Subroutine for introduction.                            |

When you have typed in the program Save it by using the self-start facility. When it is run you will be greeted with the introduction and instructions.

```

10 PAPER 7: INK 0: CLS
10 GO SUB 2000
20 LET X=1: LET Y=1
30 IF INKEY$="I" OR INKEY$="J"
THEN BEEP .1:0.1: INPUT "What?";
A7(0-7): INK: INK: INK
40 IF INKEY$="S" OR INKEY$="5"
THEN BEEP .1:0.1: SAVE "PICTURE"
CODE 16704,6918
50 IF INKEY$="P" OR INKEY$="P"
THEN BEEP .1:0.1: GO SUB 110: GO
SUB 170: GO SUB 240
60 IF INKEY$="G" OR INKEY$="G"
THEN BEEP .1:0.1: GO SUB 300
70 IF INKEY$="U" OR INKEY$="V"
THEN BEEP .1:0.2: CLS
80 IF INKEY$="L" OR INKEY$="L"
THEN BEEP .1:0.1: LOAD "CODE"
90 IF INKEY$="C" OR INKEY$="C"
THEN BEEP .1:0.1: GO SUB 750
100 IF INKEY$="O" OR INKEY$="O"
THEN BEEP .1:0.1: GO SUB 900
100 GO TO 30
110 LET flash=0: LET bright=0
120 INPUT "Change ink colour? (Y/N)";a$
130 IF a$="Y" OR a$="Y" THEN IN
PUT "What ink? (0-7)";ink: INK in
k
140 IF a$="Y" OR a$="Y" THEN
GO TO 150
150 INPUT "Y-coordinate? (0-20)";
Y: IF Y>20 OR Y<0 THEN GO TO 150
160 INPUT "X-coordinate? (0-30)";
X: IF X>30 OR X<0 THEN GO TO 160
165 RETURN
170 INPUT "What?";a$
180 INPUT "Do you want it to fl
ash?";b$
190 IF b$="Y" OR b$="Y" THEN LE
T flash=1
200 IF b$="N" OR b$="N" THEN LE
T flash=0
210 INPUT "Do you want it brig
ht?";c$
220 IF c$="Y" OR c$="Y" THEN LE
T bright=1
230 IF c$="N" OR c$="N" THEN LE
T bright=0
235 RETURN
240 PRINT FLASH: BRIGHT b
RIGHT AT Y,X:G$
250 RETURN
260 PRINT "0: 1: 2: 3: 4: 5: 6: 7: 8: 9: A: B: C: D: E: F: G: H: I: J: K: L: M: N: O: P: Q: R: S: T: U: V: W: X: Y: Z: [":
ASTU"
310 PAUSE 0: INPUT #1: "Which? (1
-21)";g$
320 IF g$=1 THEN GO SUB 120: GO
SUB 180: GO SUB 550
330 IF g$=2 THEN GO SUB 120: GO
SUB 180: GO SUB 560
340 IF g$=3 THEN GO SUB 120: GO
SUB 180: GO SUB 570
350 IF g$=4 THEN GO SUB 120: GO
SUB 180: GO SUB 580
360 IF g$=5 THEN GO SUB 120: GO
SUB 180: GO SUB 590
370 IF g$=6 THEN GO SUB 120: GO
SUB 180: GO SUB 600

```

```

380 IF g$=7 THEN GO SUB 120: GO
SUB 180: GO SUB 610
390 IF g$=8 THEN GO SUB 120: GO
SUB 180: GO SUB 620
400 IF g$=9 THEN GO SUB 120: GO
SUB 180: GO SUB 630
410 IF g$=10 THEN GO SUB 120: GO
SUB 180: GO SUB 640
420 IF g$=11 THEN GO SUB 120: GO
SUB 180: GO SUB 650
430 IF g$=12 THEN GO SUB 120: GO
SUB 180: GO SUB 660
440 IF g$=13 THEN GO SUB 120: GO
SUB 180: GO SUB 670
450 IF g$=14 THEN GO SUB 120: GO
SUB 180: GO SUB 680
460 IF g$=15 THEN GO SUB 120: GO
SUB 180: GO SUB 690
470 IF g$=16 THEN GO SUB 120: GO
SUB 180: GO SUB 700
480 IF g$=17 THEN GO SUB 120: GO
SUB 180: GO SUB 710
490 IF g$=18 THEN GO SUB 120: GO
SUB 180: GO SUB 720
500 IF g$=19 THEN GO SUB 120: GO
SUB 180: GO SUB 730
510 IF g$=20 THEN GO SUB 120: GO
SUB 180: GO SUB 740
520 IF g$=21 THEN GO SUB 120: GO
SUB 180: GO SUB 750
530 IF g$=21 OR g$=1 THEN GO TO 3
CG
540 RETURN
550 PRINT FLASH: BRIGHT b
RIGHT AT Y,X:G$
560 PRINT FLASH: BRIGHT b
RIGHT AT Y,X:G$
570 PRINT FLASH: BRIGHT b
RIGHT AT Y,X:G$
580 PRINT FLASH: BRIGHT b
RIGHT AT Y,X:G$
590 PRINT FLASH: BRIGHT b
RIGHT AT Y,X:G$
600 PRINT FLASH: BRIGHT b
RIGHT AT Y,X:G$
610 PRINT FLASH: BRIGHT b
RIGHT AT Y,X:G$
620 PRINT FLASH: BRIGHT b
RIGHT AT Y,X:G$
630 PRINT FLASH: BRIGHT b
RIGHT AT Y,X:G$
640 PRINT FLASH: BRIGHT b
RIGHT AT Y,X:G$
650 PRINT FLASH: BRIGHT b
RIGHT AT Y,X:G$
660 PRINT FLASH: BRIGHT b
RIGHT AT Y,X:G$
670 PRINT FLASH: BRIGHT b
RIGHT AT Y,X:G$
680 PRINT FLASH: BRIGHT b
RIGHT AT Y,X:G$
690 PRINT FLASH: BRIGHT b
RIGHT AT Y,X:G$
700 PRINT FLASH: BRIGHT b
RIGHT AT Y,X:G$
710 PRINT FLASH: BRIGHT b
RIGHT AT Y,X:G$
720 PRINT FLASH: BRIGHT b
RIGHT AT Y,X:G$

```



```

730 PRINT FLASH flash; BRIGHT B
right AT y,x; "S": RETURN
740 PRINT FLASH flash; BRIGHT b
right AT y,x; "T": RETURN
750 PRINT FLASH flash; BRIGHT b
right AT y,x; "U": RETURN
760 LET a=0: LET b=0
770 INPUT "X-Coordinate?(0-255)"
780 INPUT "Y-Coordinate?(0-175)"
790 IF a<0 OR a>255 THEN GO TO
770
800 IF b<0 OR b>175 THEN GO TO
770
810 INPUT "How long?(B-no/F-no)"
820 INPUT "How long?(U-no/D-no)"
830 PLOT a,b
840 DRAW e,f
850 RETURN
900 PRINT #1;"Define characters"
910 PAUSE 0
920 INPUT "What graphic?(A-U)",
930 FOR j=0 TO 7
940 INPUT "What no?(0-255)": ch
950 POKE USR 48+j, ch
960 NEXT j
960 RETURN
9900 LET ink=0
9910 PRINT AT 0,0;"PICTURE-MAKER"
9920 PRINT AT 1,8;"-----"
9930 PRINT : PRINT "S=Saves pres
ent screens."
9940 PRINT : PRINT "I=Changes pr
esent ink colour."
9950 PRINT : PRINT "D=Enables us
er defined graphics."
9960 PRINT : PRINT "to be used"
9970 PRINT : PRINT "L=Loads a sc
reens of graphics."
9980 PRINT : PRINT "P=Enables yo
u to draw by you"
9990 PRINT : PRINT "inputting
x and y coordinates."
9100 PRINT : PRINT "C=Character
defin."
9110 PRINT : PRINT "U=clear scre
en."
9120 PRINT : PRINT "R=places te-
xt."
9130 PRINT #1," PRESS ANY KEY"
9140 PAUSE 0: CLS

```

```

9150 PRINT AT 0,0;"PICTURE-MAKER"
9160 PRINT AT 1,8;"-----"
9170 PRINT : PRINT "You can make
your own defined"
9180 PRINT : PRINT "characters b
y you making them"
9190 PRINT : PRINT "out first an
d then putting in"
9200 PRINT : PRINT "them in,when
you are told."
9210 PRINT AT 11,11, INK 2, FLAS
H 1;"WARNING": FLASH 0
9220 PRINT : PRINT "If you put i
n a draw statement"
9230 PRINT : PRINT "which is out
of range,you will
9240 PRINT : PRINT "have to pres
s key C so you will"
9245 PRINT : PRINT "not lose you
r screens."
9250 PRINT : PRINT "PRES
S ANY KEY": PAUSE 0: CLS
9255 INK 0
9260 PRINT AT 0,1;"PICTURE-MAKER
-Hints for use"
9270 PRINT AT 1,1;"-----"
9280 PRINT : PRINT "Use Graphic/
Text planning sheet"
9290 PRINT : PRINT "to set out p
icture."
9300 PRINT : PRINT "Work out eve
rything first to"
9310 PRINT : PRINT "make sure th
ere are no errors."
9320 PRINT : PRINT "as it is ver
y difficult to"
9330 PRINT : PRINT "correct with
out losing screens."
9335 PRINT : PRINT "Make sure CA
PS lock is on."
9340 PRINT : PRINT : PRINT : PRI
NT: PRINT : PRINT "PRES
S ANY KEY"
9350 PAUSE 0: CLS
9360 POKE 23609,50
9400 INPUT "What paper colour?(0
-7)": p
9410 INPUT "What ink?(0-7)": ink
9420 IF p<0 OR p>7 THEN GO TO 93
60
9430 IF ink<0 OR ink>7 THEN GO T
O 9360
9440 PAPER p: INK ink: CLS
9450 RETURN

```

Designer  
by D Nation

## Joystick Draw on Dragon

This program shows how the joystick commands on the Tandy/Dragon can be

used to draw intricate designs. The program uses the right hand joystick, and works as follows. If the joystick is moved upwards the X co-ordinate is decremented. If the joystick is moved downwards the X co-ordinate is incremented.

This is superior to the programs pre-

viously submitted for this purpose. These previous programs plotted the reading of the joystick ports multiplied by 2.

This can be used with the screen dump program and screens can be saved by pressing 'S'. The screen can be cleared by pressing 'C'.

```

10 REM **JOYSTICK DRAW 26/12/83**
20 REM **BY D.BRYAN *****
30 PMODE4:SCREEN1,1:PCLS
40 X=JOYSTK(0);Y=JOYSTK(1)
50 IF X<20 AND XC>0 THEN XC=XC-1
60 IF X>40 AND XC<256 THEN XC=XC+1
70 IF Y<20 AND YC>0 THEN YC=YC-1
80 IF Y>40 AND YC<192 THEN YC=YC+1
90 PSET(XC,YC,5)
100 A$=INKET$
110 IF A$="S" THEN 140
120 IF A$="C" THEN PCLS

```

```

130 GOTO40
140 CLS
150 SCREEN0,1:INPUT"IS CASSETTE READY";Q
$:IF LEFT$(Q$,1)="Y" THEN 170ELSE 150
160 SCREEN0,1
170 PRINT"SAVING SCREEN"
180 CSAVEN"SCREEN",1536,7679,1536
190 CLS:[INPUT"ANOTHER SCREEN";A$:IF LEFT
$(A$,1)="Y" THEN RUN ELSE 130

```

Joystick Draw  
by D Bryan

## Little Meanies

on BBC

The main idea of this game is to stop the invaders reaching the bottom of the screen. If they get there a small part of your defence is knocked away until eventually they reach a flashing white line and you'll die. Each

time you fire you lose 1 bullet. About every 12 seconds a yellow ship comes down and gives you more bullets. If you shoot the ship then you lose bullets.

### Program notes

70-110 Jump to other Procedures  
130-150 Defines Characters and sets up the Game screen  
450-720 Main program prints invaders

930-990 Moves Invaders  
1150-1360 Prints out screens

### Variables

| Score  | Your Score   |
|--------|--------------|
| Bul    | Bullets left |
| Ene    | Energy ship  |
| X, Y   | Meanie 1     |
| X1, Y1 | Meanie 2     |
| X2, Y2 | Meanie 3     |

```

0 REM ***** 15/3/84 *****
1 REM *****
2 REM * LITTLE *
3 REM * MEANIES *
4 REM * *
5 REM * by *
6 REM * *
7 REM * ALAN WINSTON *
8 REM *****
10 MODE7
20 IFM1 0
30 ON ERROR GOSUB1030
40 SCORE=0 BUL=15 ENE=0
60 VDU23,1,0,0,0,0
70 PROC'TABEL(2)
90 MODE2
100 PROCSETUP
110 PROCPLAY
130 DEFPROCSETUP
140 VDU23,242,255,255,255,255,255,255,255,255
150 VDU23,243,0,0,128,224,252,128,0,0
160 VDU23,240,255,212,312,240,128,240,0,0
170 VDU23,244,0,0,1,1,63,1,0,0
180 VDU23,245,0,0,1,0,0,128,128,60,60,60
190 GOTO
200 REPEAT
210 FORO=0TO3
220 COLOUR2
230 PRINTTAB(0,0);CHR$242
240 PRINTTAB(0+16,0);CHR$242
250 NEXT
260 W=W+1 UNTILW=26
270 REPEAT
280 COLOUR2 IFW=27THENCOLOR15
290 FORO=0TO19
300 PRINTTAB(0,0);CHR$242
310 NEXT
320 W=W+1 UNTILW=30
330 W=0
340 PRINTTAB(0,0)
350 ENDPROC
360 DEFPROCQUIN
370 VDU4
380 VDU23,1,0,0,0,0,0,0,0,0
390 COLOUR12 PRINTTAB(0,1);"SCORE=";SCORE;TAB(10,1);
    "BULLETS=";BUL IFBUL<10 THEN PRINT " "
410 COLOUR2
420 IFENE=0 THEN A=RND(1000) IFTIME>A+2000THEN PROCENER
430 VDU5
440 ENDPROC
450 DEFPROCPLAY
460 X=RND(600)+300 Y=1000
470 GCOL0,2
480 X1=RND(600)+300 Y1=1200
490 X2=RND(600)+300 Y2=1400
500 C=0
510 VDU5
520 REPEAT
530 GCOL0,1
540 MOVEX,Y PRINTCHR$240
550 GCOL0,4
560 MOVEX1,Y1 PRINTCHR$240
570 GCOL0,5

```

```

580 MOVEX2,Y2 PRINTCHR$240
590 IFY<100 ORY1<100 OR Y2<100 THENPROC'TABEL(0)
600 AS=INKEY$(1)
610 IFAS="Q"ANDTIME>T+100 ORAS="Z"ANDTIME>T+100
    THEN SOUND1,-10,100,3 BUL=BUL-1:PROCFIRE
615 FORDEL=0TO100 NEXT
620 MOVEX,Y GCOL0,0 PRINTCHR$240
630 MOVEX1,Y1 PRINTCHR$240
640 MOVEX2,Y2 PRINTCHR$240
650 GCOL0,3
660 PROCMOVE
670 IFPOINT(X-10,Y<10) ORPOINT(X+54,Y<10)
    THENPROCENDINV(0)
680 IFPOINT(X1-10,Y1<10) ORPOINT(X1+54,Y1<10)
    THENPROCENDINV(1)
690 PROCGUN
700 IFPOINT(X2-10,Y2<10) ORPOINT(X2+54,Y2<10)
    THENPROCENDINV(2)
710 UNTILL=1
720 GOTO160
730 DEFPROCFIRE
740 IFBUL=0 THEN PROC'TABEL(0)
750 T=TIME
760 A=0
770 IFAS="Q"THEN P=300 Q=815 1-970 ELSE
    P=300 Q=425 1-970
780 GCOL0,7
790 MOVEX,0 DRAW1,0
800 FORO=310TO970 STEP30
810 IFPOINT(Q,0+3)=1THEN A=1 ELSE IFPOINT
    (Q,0+3)=4THEN A=2 ELSE IFPOINT(Q,0+3)
    =5THEN A=3 ELSE IF POINT(Q,0+3)=3 THEN A=10
820 NEXT
830 GCOL0,0 MOVEX,0 DRAW1,0
840 PROCFFIRE(A)
850 GCOL0,2
860 A=0
870 IFBUL=0 THEN PROC'TABEL(0)
880 ENDPROC
890 DEFPROCENDINV(00)
900 GCOL0,0
910 IFQ=0 THEN MOVEX,Y PRINT " X=Y=RND(600)+300
    Y=1000 ELSE IFQ=1 THEN MOVEX1,Y1 PRINT "
    X1=RND(600)+300 Y1=1000 ELSE MOVEX2,Y2
    PRINT " X2=RND(600)+300 Y2=1000
920 ENDPROC
930 DEFPROCMOVE
940 A=RND(50)+25 X=X+A
950 A=RND(50)+25 X1=X1+A
960 A=RND(50)+25 X2=X2+A
970 A=RND(50)+25 Y=Y+A
980 A=RND(50)+25 Y1=Y1+A
990 A=RND(25)+33 Y2=Y2+A
1000 SOUND2,-6,130,5 SOUND3,-6,170,5
1010 IFENE=1 THEN PROCNE
1020 ENDPROC
1030 MODE7 IFERR=17 THENRETURN ELSE REPORT
    PRINT " in line ",ERR
1040 END
1050 DEF PROCFFIRE(A)

```



```

1060 IFA=0 THEN ENDPROC
1070 MOVE:Y GOLOS,0 PRINTCHR#240
1080 MOVE:Y1,Y1,PRINTCHR#240
1090 MOVE:Y2,Y2,PRINTCHR#240
1100 IFA=1 THEN Y1=1000 ELSE IFA=2 THEN Y1
      =600 Y1=1000 ELSE IFA=3 THEN Y2=1000 Y2=600
1110 IFA=10 THEN VDU4 PRINTTAB(10,Y1)
      " BULLETS=0 EEE=0 TIME=0 T=0 VDU5 ENDPROC
1120 SCORE=SCORE+10
1130 FORD=1024 SOUND1=-15,PIN=50,Y1=0.5 NEXT
1140 ENDPROC
1150 DEFPROC TABELNUM
1160 IFNUM=2 THEN I2=0
1170 VDU4 COLOUR13 PRINTTAB(10,1)"BULLETS=0"
1180 FORD=1024 READ IFD=3 THEN PROCREST
      NEXT ELSE SOUND1=-10,D.5 NEXT
1190 VDU32,7,23,1,0,0,0,0, RESTORE
1200 PRINT CHR#129,CHR#141," LITTLE MEANIES"
1210 PRINTCHR#129,CHR#141," LITTLE MEANIES"
1220 PRINT "Your score was " SCORE
1230 IFNUM=1 THEN PRINT "You had no bullets
      left" ELSE PRINT "The saved got you"
1240 PRINT CHR#130,CHR#136" PLESS THE SPACE
      BAR TO CONTINUE" VDU23,1,0,0,0,0,0
1250 REPEAT A=CET UNTIL A=32
1260 CLS RUN
1270 CLS
1280 PRINT CHR#157CHR#141CHR#129," LITTLE MEANIES"
1290 PRINTCHR#157CHR#141CHR#129," LITTLE MEANIES"

```

```

1300 PRINTCHR$157CHR$130."          by ALAN WINSTON"
1310 PRINT "CHR$130." Little Meanies is a
      game of skill. " CHR$130."In which you have
      to shoot down enemy "CHR$130."invaders."
1320 PRINT "CHR$133:"To do this you have 2 runs on
      each side,"CHR$133."of your defence."
1330 PRINT "Keys for the guns are. ""Q,UPPER GUN
      Z,LOWER GUN""
1340 PRINT "CHR$136:CHR$134." PRESS THE SPACE
      BAR TO PLAY"
1350 REPEAT A=GET UNTILA=32
1360 TIME=0 T=0 ENDPROC
1370 DATA129,129,0,129,129,0,129,129,132,145,145,0,
      181,181,0,181,181,0,189,189,189,117,101,101
1380 DEFPROCEDIST SOUND(1,0,0) : ENDPROC
1390 DEFPROCENCL
1400 X=X-RND(.5)*T,Y=Y+R
1410 Y=Y+I+1
1420 EEE=1 ENDPROC
1430 DEFPROCE
1440 IF T, 25 THEN EEE=0 VDU4 PRINTTAB(X,Y,")
      " VDU4 BUL=BUL+RND(.3)+TIME-0 * +TIME ENDPROC
1450 VDU4 PRINTTAB(X,Y,X,Y," "
1460 GOLOS
1470 Y=Y+1
1480 EEE=1 PRINTTAB(X,Y,X,Y),CHR$240
1490 SOUND 4 -10,200,1
1500 JUMP
1510 ENDPROC

```

**Little Meanies**  
by Alan Winslow

## Arcade Avenue

## 3D Graphics

**E**ver on the lookout for new twists on old ideas to make a game stand out, some software companies have exploited the growing interest in spectacular graphics, in particular 3D graphics, to breathe new life into many of our old arcade favourites. Possibly the first of this type onto the market was *Haunted Hedges* written by Derek Brewster for Micro-mega. It was a 3D version of Pacman for the Spectrum which presented a slightly angled perspective on the screen and had the ghosts partially disappearing from view as they ran around the maze walls. Further games soon followed which exploited similar ideas. 4D (sic) *Terror Daktil* from Melbourne House was essentially a space invaders/galaxian variant with the monsters enlarging as they peel off from the ranks and fly towards you.

This was one of Melbourne House's less warmly welcomed programs because, although it was quite a nice idea and fairly well executed, there seemed to be something missing with regard to playability. In fact, this is often true of games in this category — despite the flashy screen displays something has been sacrificed in terms of the excitement and tension of the original games.

One exception to this rule must be *Android 2* from Vortex software which presents another 'angled perspective' but this time in a game rather like *Frenzy* or *Berzerk*.

Vortex had an earlier program known as *Android 1* which was a reasonable version of the original two dimensional format but in *Android 2* they have produced a game that improves on the excitement and difficulty as well as providing some of the best graphics seen on the Spectrum. It is certainly the most outstanding piece of software I shall men-

tion this week.

Turning to other machines, *Jumping Jack* from Sumlock for the CBM 64 is a game that I confess I have not played, but the screen shots in the advertisement look entertaining with sideways views of the trucks, crocodiles and the like in a 3D version of *Frogger*. For the BBC, MRM Software have just released a range of games which includes *Q Man's Brother*, essentially a 3D *Painter* and, coming full circle, *3D Munchy* which is of course a *Pacman* game. Not surprisingly for the BBC, the graphics are good enough to make the tradeoff with pace and addictiveness less painful. These games are not at all bad and are reasonably priced, although I must admit that I preferred MRM's original game *Diamond Mine* which, although much simpler in concept and screen display, was much more fun, frustrating and addictive. Anyway, all MRM games have a screen shot on the cassette

inlay so what you see is what you get.

In summary, with one or two exceptions, the prefix 3D on these games often means you are being asked to substitute game quality for a more complex screen display and you should be aware of that before you buy. However, I am sure that this is a successful hook for breathing new sales into an old game and will be around for a long time. Even in the arcades similar plays are appearing — *Zaxxon* is little more than a 3D version of *Scramble*, but there is no doubt that it's a winning game, and for once the 3D is used to add to the difficulty and skill of playing.

**Tony Kendle**

The Arcade Corner is a new section for anyone who enjoys playing arcade games. If you have any comments, from playing tips on difficult games or programs you'd particularly like to praise (or blame!) then write to: Tony Kendle, Arcade Avenue, *Popular Computing Weekly*, 12-13 Little Newport Street, London WC2R 3LD.

## Halley's Comet

on Vic20

This program first draws the sun and earth proceeded by the path of Halley's comet. It

then draws a comet which proceeds around the path. To break you must press the space bar.

### Program notes

0-185 Prints out path etc.

190

200

210-217

220-225

1000-

Read in data and checks it at the end  
Sets up the place and colour of the comet  
If comet reaches a point it flashes comet  
Print a dot after it has passed  
Data for positions

```

1 REM HALIES COMET
5 REM BY ANDREW LILLY
10 PRINT "THE PATH OF HALIES COMET"
20 PRINT
25 PRINT "  .  "
26 PRINT "  .  "
30 PRINT "  .  "
40 PRINT "  .  "
50 PRINT "  .  "
60 PRINT "  .  "
70 PRINT "  .  "
80 PRINT "  .  "
90 PRINT "  .  "
100 PRINT "  .  "
110 PRINT "  .  "
120 PRINT "  .  "
130 PRINT "  .  "
140 PRINT "  .  "
150 PRINT "  .  "
160 PRINT "  .  "
170 PRINT "  .  "
180 PRINT "  .  "
185 PRINT "PRESS SPACE TO EXIT READY"

190 READ P,IFP=-1 THEN RESTORE:GOTO 190
200 A=P+38400:P=P+7680
210 POKE P,90
212 POKE A,6
215 FOR D=1 TO 500: NEXT
216 IF D=7911 THEN FOR G=1 TO 100: PRINT "COMET"
217 IF D=7911 THEN PRINT "COMET"
220 POKE P,46
225 POKE A,8
227 GET Z$:IF Z$=" " THEN PRINT "E"
230 GOTO 190
500 FOR R=1 TO 10000: NEXT
1000 DATA 430,431,411,390,368,326,277,231,184,1010
1010 DATA 138,92,68,87,88,110,130,177,200,223,269,315,361,384,407
1020 DATA -1

```

Halley's Comet  
by A Lilly

## Microradio

GW6JJN



### Radio teletype

Both this week's and next week's Microradios will be devoted to two very advanced programs recently released by G4IDE Micro Systems of 10 Fontwell Road, Wolverhampton, WV10 6PS.

The two programs are devoted to two important aspects of radio-computing, namely radio teletype and slow scan television. This week we'll deal with radio teletype (RTTY). The program comes in a cassette with RTTY4 for the 16K Spectrum on one side and RTTY5 for the 48K on the other. Both load easily and

faultlessly and the user is then asked for the time in hours and minutes. When this is entered, a real time clock is permanently displayed in the top left hand side of the screen. This is the first time I have seen a real time clock on an RTTY program, but this was only the first of several surprises.

The real criteria by which such a program must be judged is whether or not it will do the job it sets out to do, namely receive and transmit RTTY. The answer to this in the case of the G4IDE program is an unqualified yes. It receives and transmits RTTY superbly. All that is needed in addition to the program is an interface and a terminal unit. Most people will have such things already but if not, the literature accompanying the program explains simply and in great detail how these units can be constructed. They can also be purchased if required.

With my computer con-

needed to a radio transceiver. I was able to send and read RTTY so well that I got a bit carried away and ended up writing this review at an unearthly hour. The program is a pleasure to use and this is due not only to its efficiency but to the extras it contains. I have already mentioned the clock which not only tells the time but will transmit the time automatically when required. There are built-in pages containing your callsign and test procedures — there are also 26 user definable stores into which all sorts of information can be saved for instant transmission. Another aspect of this program is the split-screen operation which means that your answer can be composed concurrently with the incoming message and sent at the press of a key.

A further feature is the ability to capture the other stations callsign and automatically enter it into a store. Space simply

does not permit a full list of all the possibilities available, but I must add that the program contains a routine to use the Spectrum as a frequency counter and, as if this was not enough, a baud rate checking routine is thrown in for good measure. The literature even explains how to make a back up copy of the program which is refreshing and indicates an attitude of friendliness that is embodied in this excellent piece of software. Roger Barker who wrote this program is a professional programmer and it shows in what must become the ultimate Spectrum RTTY program.

Ray Berry GW6 JJN

This series of articles is designed for radio and microcomputer enthusiasts alike. If you have any queries that you want answered, hints and tips to share, or topics that you would like to see covered, write to: Ray Berry, Microradio, Popular Computing Weekly, 12-13 Little Newport Street, London WC2R 3LD.



# 39,300

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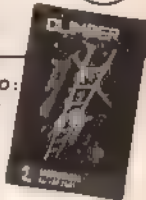
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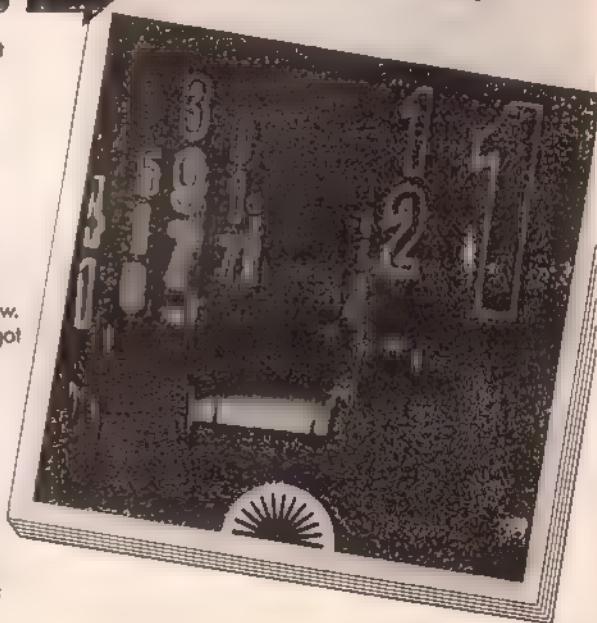
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# Tony Bridge's Adventure Corner



## Valhalla revisited

**M**C Lothlorien is well known for its war simulations — and now for a successful adventure *The Stolen Lamp*. Written for the BBC, this text-only adventure has become a popular and worthy addition to the range available for the Acorn micro.

Mike Williams, London N16, recently wrote to me with some tips for *Lamp*. I haven't got room enough, this week, to pass them all on, so let's concentrate on one area this week. First off, the coin:   
BIUS/YRTE HGEU CIAR REPD ETTO

The message, you must *Read* this ■ get the day's password, which you will need:   
★TOO/NFL/YQT UHTE ODOA ORRP SEIT

The sword may seem useful (you knock off a few people here and there), but will eventually prevent you from winning the game. You will find a column and a pillar in the entrance hall — there is an object in both of these, but there is also a snag. Should you smash both ■ them, the ceiling will fall on you! From what I've told you so far, you should have an idea what to do. . . .

More Hints 'n' Tips from Mike's informative letter ■ a later date

Hadnan Hudson, from West Yorkshire, writes asking for help ■ *Raaka-Tu*, on his TRS-80. He has a few objects with him — the coin, gold ring, chopstick, idol and jewelled lever, and he has a score of 20 out of ■ possible 50. Hadnan has to pass a statue in a triangular room, and to do so, has to give up the coin, thus losing 5 points. Is there another way ■ passing the statue?

Also, how does he get over the oriental rug, concealing a trap, ■ the second room? Does he need the sword after killing the dragon, and the candle after killing the gargoyle? Quite a few questions there, can anyone help? The problem with the statue sounds familiar from several other adventures — you may have to sacrifice the coin and try to retrieve it later by tempting the statue with a worthless bauble on your way back.

"Dear Tony, in view of the wide interest in the difficult and absorbing program *Valhalla*, will you please make urgent amends for

your dreadful neglect of it in your pages? Best regards, Peter Jones, South Glamorgan."

"Dear Tony, where are all the *Valhalla* hints and problems? Surely a few million have been sold — is it so easy that no one has had problems, or have they just thrown it in the bin because of its difficulty?"

These letters, from G. Sim of Paignton, and Peter Jones, are just a couple of the many I've received about *Legend's* adventure. Mr/Ms Sim goes on to say: "My hint to find Onir is — You need Boldir's help. Another hint for Onir is:

AGNO KNSW HIAN LKLR

I have to admit that I haven't mentioned *Valhalla* as often as other adventures, such as the Scott Adams series, *Knight's Quest* and *The Hobbit*. In fact, only twice (Vol 2, No 24 and Vol 3 No 10) to 12 Corners dedicated to *The Hobbit*. In some ways, this reflects my own feelings about *Valhalla* — if I have a few hours to spare, staring ■ the screen, then I go to *Valhalla*, and can only admire the graphics. But it is not my favourite program.

Actually, as I've said before, *Valhalla* seems more like a computer movie, whose proceedings can be influenced in some degree by the player. I find clues difficult to give, as each action depends so much on what the player has done before. In the space I have each week, I can't even begin to scratch the surface, so I'll draw your attention to this month's issue of *Popular's* sister magazine, *Micro Adventurer* (if you're a keen adventurer, you'll have taken out a subscription!), ■ which Mike Stackwell has written the definitive article on



solving *Valhalla*. Read this, and ■ should become . . . well, a lot clearer than it may be at the moment!

■ A. Booth has written with several very useful clues. "Hunt in the far-flung corners of the world for the key top success — behind the iron man, he may have a crowbar — ■ you cannot get on with your valuables, trust a weak friend — befriend your enemy to make the top of hell ring — there must be give and take to find protection."

John Rumble from Aldershot has given me a couple of hints that might also be useful. He says: "A good move is to throw a fireball ■ Krank when in Krisk's Hall. To get Drapnir:

DOAP:SEKN:SCAH/GEAS/TOUPNLI/ACCE/EWO-  
AFSNT/IER/INNH/CEHL/E★SA/TN

Phew! I hope you can decipher that lot — as usual, starting from the *second* letter, read off every other letter, then return to the first and repeat the process. The slashes (/) are to break up the letters for ease of reading.

R. Smith, of Rushden has a couple of queries (accompanied by several maps of other adventures he has completed, for which much thanks. First of all, "What is the significance of the various flags going up and down?" — I think that is probably just a bit of gratuitous animation, but maybe someone else knows better. "If a number is entered, the program responds 'there is no crown here'. No mention of a crown in the instructions? No, except that the crown is Norse currency!



*Valhalla* needs more space than I have this week — if someone, who has persevered more than I, and has completed a fair amount, would like to write and let me have a few more clues, particularly to later parts, I can pass them on. By the way, a version of *Valhalla* for Commodore 64 is now delayed until late May.

At the recent ZX Microfair at Alexandra Palace in London, Crystal Computing were showing the old favourite, *Halls Of The Things*. You may remember that I quite enjoyed this program some time ago — it's not strictly an adventure, but does contain some of the elements of fantasy "Troll-bashing". I'm glad to see that one fan thinks enough of the program to set up the *HOTT Appreciation Society*. For £1 membership, fellow fans will receive quarterly newsletters with hints on playing, special offers and so on. Sounds good! Write to:

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(and tell 'em you read it here!)

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# Peek & Poke



## LEADING QUESTION

J. Mills of Bromley, Kent, writes:

**Q** Having a ZX Spectrum with Interface 1 and Micro Drive, can you please inform me if I purchased a RS232 Sinclair lead, would this make the Spectrum compatible with the Silver-Reed EX43 Electronic Typewriter/Printer, without purchasing their Memory-matic M40/44 or Interface 1/F40?

**A** I don't actually know the device concerned but as long as it has a standard RS232 interface port then you will be OK.

■ You are in any doubt as to the cables or extra interfaces that you may need, then I suggest that you consult Maplins (not the holiday camp) catalogue (available at most computer book shops and a number of high street retailers).

## WAITING GAME

J. Roberts, Glenconner, Liverpool, writes:

**Q** May I please have your comments regarding the ethics of offering programs to software companies for evaluation?

The particular aspect I have in mind concerns the period of time elapsing between the companies' receipt of a program and its evaluation.

I sent a program to a company about 11 weeks ago. I received their acknowledgment by return post but since then I

have heard nothing. I rang them about 2 weeks ago and the reply was that they receive many programs and each is dealt with in rotation. The inference I drew from this was that I would just have to wait.

My program is an adventure type, and the theme is one which as far as I can tell, has not been covered before.

I am therefore very anxious to get my program properly evaluated before someone else "thinks" of my idea.

Would you consider it right to offer a program to several companies within a few days and then to sit back and wait for the first acceptance?

**A** Although I think that it is unrealistic to expect any company to give a game a real evaluation in anything under 2 weeks, it is fair to say that 10 weeks is nothing short of disgraceful. You would be advised to demand the return of your game and not to have any more dealings with this company.

You don't say which computer your game is for but I suggest that you choose a company that has published adventure games for your machine and submit it to them. As to ethics, I personally would not submit a program to more than one company at a time. Two rejections a month are enough for anyone.

## THERMAL PRINTER

Nicky Bell of Western Ave, Dagenham, writes:

**Q** Could you tell me if there is a six-inch plain paper thermal printer suitable for my Spectrum?

If so, what interface would I need to connect it?

**A** Epson have just launched something that sounds what you require. It's a plain paper thermal printer with a number of different printing styles that retails for £95.

There are two versions for both Centronics and RS232, although the latter is the one available first (around August). There are a number of different centronic interfaces from Kempston, Hilderbay,

Tasman, etc. All cost around £45 and can be recommended. For RS232, you could do worse than get an Interface 1—the official Sinclair interface. You will then need a lead to connect this to a five pin din which is the socket on the printer.

## RIGHT TO LEFT

Philip Aston of Pensham, Pershore, Worcs, writes:

**Q** Please could you tell me how to make the screen on the 48K Spectrum scroll from right to left, as I need it for a game I am making?

**A** This is one of those questions where I could really go over the top. I mean, do I tell you how to scroll the screen left a pixel at a time, or a character at a time? Do you need to know how to scroll the attributes file similarly (Ink, Paper etc)? I think my best approach is simply to recommend an extremely useful book, *Supercharge Your Spectrum*, published by Melbourne House, which is full of machine-code routines to make the programmer's life easier.

It also contains all the routines necessary for screen-scrolling left or right.

## NEW ASSEMBLER

Colin Eames of Queen's Drive, Swadlincote, Burton-on-Trent, writes:

**Q** As a novice machine-code programmer on my 48K Spectrum, I would very much like to purchase an assembler.

Can you give me the address of a low cost, easy to use assembler?

**A** If you really want to get into machine-code programming on the Spectrum,

then I can recommend an assembler/monitor from Hisoft called Devpac. It is available from Hisoft mail order at 60 Hallam Moor, Liden, Swindon, Wilts SN3 6LS.

The price of £14.00 may seem high, but you are getting two programs, both of which you will need.

## DISABLED DRAGON

Paul Bailey of Brynton Road, Macclesfield, Cheshire, writes:

**Q** Please, if possible, could you tell me how to disable the Break key and Reset button on my Dragon 32.

**A** To disable the Break key, enter the following Direct-mode:

Poke 411,228  
Poke 412,203  
Poke 413,4  
Poke 414,237  
Poke 415,228

Then, to "turn off" the Break key use:

Poke 410,236

## COMPUTER GAMBLE

R Kidd of Stoke Park, Ipswich, writes:

**Q** I have seen people advertising their computer for sale by offering raffle tickets. Can I do this myself, i.e. is it legal? If not, what is the best way of selling my computer?

**A** This is a complex one.

We consulted our legal experts and the conclusion seemed to be that it is quite possible you would be infringing laws against Gaming and Gambling. A much better way of selling your computer is to put a free advert in our Computerswop column. You can ask for, and get, a reasonable price if your computer is in good condition.

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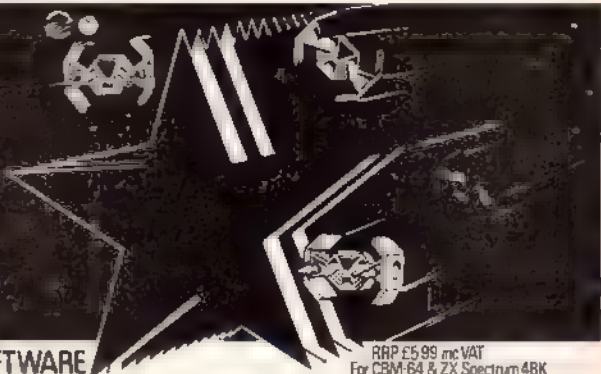


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**TO SWAP**: Black Crystal, for the 48K Spectrum, for any text Adventure, preferably level 9. Phone Southend 43685

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**WANTED ORIC 48K** without software. Ring Nuneaton (0203) 347426 evening

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**SWAP CB3 GAMES**. I have over 50 games. Tel. 01-840 5278 between 4-7.30pm.

## ADVENTURE HELPLINE

Micro: Vic 20

Adventure: Pirate Cove

**Problem:** I cannot escape from Pirate's Island. I would like to know how to open the doors and the chest

**Name:** Gary Leaver

**Address:** 14 Evenloode Close, Lodge Park, Redditch, Worcs B98 7NA

Micro: Commodore Vic-20

Adventure:

**Problem:** If there is a word processing chip in Vic + if there is a poke to get a beep everytime you hit a key

**Name:** Karl Hulton

**Address:** 4, Etherow Brow, Broadbottom, Cheshire SK14 6AA

Micro: TI 99/4A

Adventure: Scott Adam's Golden Voyage

**Problem:** I cannot find a "lamp" or "torch" to enable me to see inside the "cave" or "passionway"

**Name:** Mr M.A. Guiney

**Address:** The Hill, Langport, Somerset TA10 9PY

Micro: Commodore 64

Adventure: The Hobbit

**Problem:** I cannot get through the large trap door in the elvenking's cellar. I am always thrown back into the dungeon. Please help me!!!

**Name:** Tim Appleyard

**Address:** 453 Chester Road, Woodford, Stockport, Cheshire, SK7 1QP

Micro: Commodore 64

Adventure: The Hobbit

**Problem:** I cannot get through large trap door in the elvenking's cellar. I am always thrown back into the dark dungeon. Please help me!!!

**Name:** Tim Appleyard

**Address:** 453 Chester Road, Woodford, Stockport, Cheshire SK7 1QP

Micro: Spectrum 48k

Adventure: The Lost Gnomes (Adventures of Eric Beam)

**Problem:** How can I awaken Snort the Gnome?

**Name:** D. Peberdy

**Address:** 19 Oxgate Court, Coles Green Road, Brent NW2

Micro: 48k Spectrum

Adventure: Hewson Consultants "Quest"

**Problem:** I can unlock the castle door, but not open it

**Name:** Peter Harrison

**Address:** 45 Crescent, Chester Moor, County Durham, DH2 3RT England

Micro: Commodore 64

Adventure: Hobbit

**Problem:** I can not get out of the Goblins dungeon. I can not escape from the "pale bulbous eyes" and I would like to get the ring!

**Name:** Neil Phillips

**Address:** 11 Lansdowne Cres, Werrington, Stoke-on-Trent, Staffs ST9 0LL

## Diary

| Event   | Venue                                 | Dates  | Admission  | Organisers   |
|---|---------------------------------------|--|--|--|
| Apple 84  | Fulcrum Centre<br>Slough              | May 24-25<br>10.30am-5.30pm<br>May 26<br>10.30am-4.30pm  | £2.00<br>on door<br>(free tickets<br>in advance<br>from<br>organisers) | Database Publications,<br>68 Chester Road,<br>Hazel Grove, Stockport<br>061-456 5383 |
| North Wales<br>Computer Fair  | Memorial Hall<br>Boothdydd<br>Wrexham | May 26<br>10.00am-4.00pm   | 50p adults<br>25p children<br>£1.00<br>family ticket                   | Wrexham &<br>District Computer<br>Club   |
| Ceter (Consumer<br>Electronics<br>Trade Exhibition)<br>(Trade only) | Earls Court                           | May 27-30<br>10.00am-7.00pm  | Free   | Montbald Ltd<br>11 Manchester Sq<br>London W1<br>01-486 1851                         |
| 5th International<br>Commodore<br>Computer Show                     | Novotel<br>Hammersmith, London        | June 7-8<br>10.00am-6.00pm<br>June 9<br>9.00am-5.00pm  | £2.00 adults<br>£1.00<br>children<br>£3.00<br>family ticket            | Granard Communications,<br>4 Babmaes St,<br>London SW1<br>01-930 8711                |
| The Computer Fair   | Hall D Earls Court<br>London          | June 14<br>10.00am-6.00pm<br>(trade and press only)<br>June 15-16<br>10.00am-6.00pm<br>June 17<br>10.00am-5.00pm | £3.00<br>adults<br>£2.00<br>children &<br>OAPs                         | Reed Exhibitions,<br>Surrey House,<br>Thornley Way,<br>Sutton, Surrey<br>01-843 8040 |

### For sale

**PSION FLIGHT** simulation, only tape left, sell for £8.00. Spectrum 48K. Ask for Gary Tel: Brookwood 80053  
**TRS 80** colour computer, extended basic computer cassette recorder, joysticks, manuals, books, lots of mags, over £200 software including Co-Co.

Learning Lab, Art Gallery and Frögger, bargain at £200. Tel: Pheips, Bilton 5478.  
**SELL** Paratrooper, Wacky Waters, Amok and Wizard and the Princess, £4.50 each or swap three for an adventure cartridge or one for Flight Simulator by Ferranti. Offer taken. All new. Tel: Sean Taylor, Farnham Common 2922.

**LANGUAGE** Translator, French or German, only £4. Learn vocabulary the easy way. Post today! Send cheque, P.O. payable to Monksoft, Foxwood, Peacraft Road, Stonehouse, Glos.  
**FOR SALE**, Pat Prestel unit, complete in working order, offers? Absolutely unused, as new! Tel. Hugh Bridge, 01-735 1862

**ORIC 48K**, perfect condition, cassette recorder, worth £100. Does any game, any speed, Inc. Hobbit, Treg, Chess, Ice-Ghilt, Atrix, worth £300. Highest bid Andy 443 1460 after 7pm only  
**OSBORNE AND** Disc Drive, monitor, s/w eg Wordstar. Sell for £900. Bedford (0234) 214274

**PHILIPS VIDEO PACK** 57000 computer with Terahawks cartridge, brand new still boxed. £40. Tel: 01-567 8762.  
**ORIC 1 48K** Several games, manual, under guarantee swap for 48K Spectrum or sale £115.00. Tel: Rushden 311429.

**SORD M5** and joypads and Basic G. Worth £210 will sell for £170. Tel: Birmingham 551 4577 after 6pm. Jug-gant.

**VIC 20 S/W** Intex inc. Grid Runner, Arcadia and Vic pri £3.30 each inc. p&p or £10 the lot! Woking 70318.

**CONTROL DATA** 11 inch floppy disc drive good working order £99.00 will swap for 48K Spectrum 0672-810853  
**ORIC 1**, Manuals, over 45 s/w titles, tapes alone worth £250+. Bargain!!! £150 Tel Jim - Stevenage (0438) 720624 anytime. Will not split

**PRINTER PAPER** - £16.00 for 10 rolls, S/w under half price + various mags for sale. Offers Tel: 01-949 0225 after 4pm

**ORIC 48K** with manual! Excellent condition Tel: 0252 836410.

**SHARP MZ80A 48K**, £125 s/w £230 on Tel Tring 7037 (044282).

**SHARP MZ80A 48K** built in monitor and tape recorder With Basic, Pascal, games and manuals VGC Hardly used £220 on Tel: Brentwood 224336

**T199 4A**, 3 months old - cassette case, all leads + boxed etc - manual + 2 joysticks, cartridge and s/w £65 Bargain. Tel: Hornchurch 42642. After 4pm

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Tel: 0442 51809

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38 BERTON CLOSE, BLUNSDON, WILTSHIRE, SN2 4BE.

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Super Pipeline RRP £8.90 ORP £5.80

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## PROTECTED

*Haunted Abbey* is the first of A&F's games to feature its new protection device designed by Jim Lamont.

It was deliberately chosen as the first program to feature the new protection, because it was of sufficiently high quality to ensure that people would (hopefully) want to buy it rather than just copy it from friends.



The game is an adventure where you must find Phibe's Book of Incantations and collect treasure from an abbey. The text is full of extremely bad puns and the kind of puzzles that keep Tony Bridges occupied for months. To add to the strictly intellectual problems, there are a large number of horrible monsters.

**Program** *Haunted Abbey*  
**Price** £7.90  
**Micro** BBC  
**Supplier** A&F Software  
Unit 8  
Canalside Industrial Estate  
Woodbine Street East  
Rochdale, Lancs  
OL16 5LB

## READ & WRITE

*Acos+* is a utility program for the Commodore 64 by Melbourne House, usually known for more adventure orientated offerings.

Very unusual it is too. Partly it is pretty much your standard additions to Basic in sprite and

sound but this is really a lesser aspect of it. More important is what *Acos+* enables you to do with the standard Commodore data recorder.

Firstly, it speeds up the tape operation. In addition it gives you a number of other facilities which let you use the recorder rather like a disc drive.

You can form a directory of various programs on tape and save and load using *Csave* and *Cload*. You can also open channels to Read or Write to and from the file.

**Program** *Acos+*  
**Price** £8.95  
**Micro** Commodore 64  
**Supplier** Melbourne House  
131 Trafalgar Road  
London SE10

## HIGH PRICE

Atari has finally released its authentic version of *Pacman* for the Spectrum — indeed it is the company's first Spectrum release.

And what you get is quite astonishingly accurate with even the sound effects derived from the Spectrum's pathetic bleeper sound true to the original.

If you haven't yet got a version of the game and are one of those poor souls horribly addicted to the ludicrous thing this would be the one to get if it wasn't for the unbelievable price — what do Atari think they're doing?

**Program** *Pacman*  
**Price** £14.99  
**Micro** Spectrum  
**Supplier** Atari  
Retail stores

## HI-SPEED

*High Speed Dragon* is a very useful utility that enables you to keep files in programs on a single long tape and access them quickly.

The secret of the system is that it uses the cassette recorder on fast forward to find the program required; how fast this runs — which varies from machine to machine — is the determining factor on access times.

It's a simple idea which a lot of home programmers could find useful and at £3.95 (with instructions that actually encourage you to copy the program) it's excellent value.

**Program** *High Speed Dragon*  
**Price** £3.95  
**Micro** Dragon  
**Supplier** Omega Systems  
44 Curlew Road  
Abbeylea  
Gloucester  
GL4 7TP

## ROMAN MAP

*The Fall of Rome* is a strategy game with a number of nice features making it more accessible to the ordinary player (ie. rather than the committed wargamer).

You control the Roman forces and attempt to rewrite history by marshalling your armies over the plains of Europe to defend the Empire from the assorted unwashed

tribes.

You play against the computer deciding when and where



to move your forces and whether to concentrate on attacking or defending.

Although the program seems to be largely in Basic and is therefore technically unspectacular, features like the hi-res map of Europe and beautifully redesigned character set make it well worth looking at if you like this kind

Pick of the week

## IN PERSPECTIVE

*Battle Planet* for the BBC is an excellent version of the arcade game which was, in some versions at least, known as *Buck Rogers*.

Although the game is essentially only an 'avoid everything for as long as you can as the odds gets more and more insuperable you lone heroic defender of the earth' arcade shoot em up (Molly Bloom eat your heart out) it has a number of features to lift it well above the run of the mill.

For one thing it is 3D — at least in the sense that at least one or more objects in the screen is drawn with some sort of perspective. In this case it is a trench, zooming through which is your lone defender of the free and... etc — the illusion of zooming is convincingly done.

The object of all this rushing about is to destroy a battle planet which is threatening earth — naturally it is aided and abetted by numerous



assorted baddies who must be either avoided or shut down. It's very addictive and graphically very impressive.

**Program** *Battle Planet*  
**Price** £6.95  
**Micro** BBC  
**Supplier** ISP Marketing  
Hampstead House  
New Town Centre  
Basingstoke  
Hants

# New Releases

of tactical game.

**Program** *The Fall of Rome*  
**Price** £6.99  
**Micro** Spectrum/BBC/CBM  
**Supplier** 64/Atari  
Argus Press  
1 Golden Square  
London W1R 3AB

## EVERY BYTE

Not too far from the home user at £500 but of interest to small software houses is a tape protection device called *Rapid*.

What you get for your money is two Eproms that sit in the Spectrum expansion port and protect your program from a bit of the most hi-fi tape to tape copiers.

The system uses three different methods of protection, firstly it uses its own special loading routine, quite different from the one in Rom cracked by some of the copier programs.

It saves programs at twice the normal speed which is why more conventional tape to tape copiers will not work — finally it saves every byte of Ram, making programming techniques very difficult to copy.

As for some other recent developments from A&F software, it looks like it's getting harder and harder to catch the latest, dishonest, cloning.

**Program** *Rapid*  
**Price** £19.95  
**Micro** Spectrum  
**Supplier** Argus Press  
1 Golden Square  
London W1R 3AB

## PROVERBIAL

Education software is the one area that has been the most successful in the market, and what there is tends to be profitable — it's the Spectrum market.

What you get from Softback is a program that works on the Spectrum and is a number of programs with gaps to be

filled in by the child. The text is large and bold. Right and wrong answers are accompanied by, as appropriate, a smiling or frowning face.

You can enter your own stories and use them in the same way as the proverbs, asking the child to type in missing words.

**Program** *Story Book*  
**Price** £4.95  
**Micro** Oric  
**Supplier** Softbacks  
PO Box 257  
Watford WD1 3LQ

## LIBERATOR

*The Adventures of Robin Hood* is an arcade/adventure for the Atari in which the well known Marxist wealth liberator steals bags of gold and is rejuvenated by a kiss on the imprisoned cheek of maid Marian.



Actually the game has very little to do with adventures at all; it's all about running up and down, firing arrows and avoiding the sheriff's men — but it's still good fun for that.

As Tony Bridge has said before now, Atari programs have excellent graphics but always cost an arm and a leg. *Robin* is no exception by English software are by no means the worst offenders — £9.95 is not commonly excessive for a 16K Atari program.

**Program** *The Adventures of Robin Hood*  
**Price** £9.95  
**Micro** Atari  
**Supplier** English Software  
Box 43  
Manchester M60 3AF

## BEWILDERING

Astrosoft are a new software house concentrating on the Spectrum market (which is asking for trouble).

Among its first releases are two adventures, *Thief* and *The Pink Pearl*. The latter is a text adventure in which you seek out the mysterious and valuable Pink Pearl fighting off baddies and solving clues as you go.

The program looks very neatly designed with some evocative descriptions and bewildering puzzles — another nice touch is that certain baddies can only be killed with certain weapons.

From the look of the program (and I could be wrong) I'd say it was written with the Quill and on the pre-production version of the game I have, there is no credit given. I assume it's an oversight.

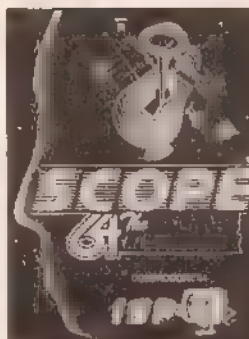
**Program** *The Pink Pearl*  
**Price** £4.95  
**Micro** Spectrum  
**Supplier** Astrosoft  
101 Church Road  
Ferndown  
Wimborne  
Dorset  
BH21 9ET

## FLEXIBLE

*Scope* is a programming language originally developed for the Spectrum and now implemented on the Commodore 64.

Unlike programs like *Games Designer* you actually have to write a program with *scope*, rather than make choices from a menu. *Scope* consists of a number of commands held in Basic Rem statements. Although this may mean that the program is less easy to use than some of its competitors, it is, conversely, much more flexible.

Using the *Scope* language, which is no more difficult to grasp than Basic, you gain machine code speed of execution of graphics and sounds. The package includes some demo programs and an exten-



sive manual which explains the language and contains listings of the Demo routines, so that you can steal them for your own use.

**Program** *Scope*  
**Price** £17.95  
**Micro** Commodore 64  
**Supplier** ISP Marketing  
Hampstead House  
New Town Centre  
Basingstoke  
Hants

## HALL OF FAME

There is, contrary to popular belief, Lynx software around, provided you know where to look for it and some of it is good — if unoriginal. A case in point is *Centipede* from Play It software.

Written in machine code, the game has all of the features of the arcade original, including a bouncing spider and a horticultural hall of fame. I liked the concise instructions which explained that the object was to 'shoot everything that moves and everything that doesn't'.

**Program** *Centipede*  
**Price** £5.95  
**Micro** Lynx  
**Supplier** Play It  
11 Sleford Road  
Boston  
Lincs  
PE21 8EY

New Releases is designed to let people know what software is coming on to the market. If you have a new game or utility which you are about to release send a copy and accompanying details to: New Releases, Popular Computing Weekly, 12-13 Little Newport Street, WC2R 3LD.



## BBC+

- 1 (-) Aviator (Acornsoft)
- 2 (6) Spooks and Spiders (Software Invasion)
- 3 (2) Eagle's Wing (Software Invasion)
- 4 (5) Adventure Quest (Level 9 Computing)
- 5 (10) Education 2 (Golem)
- 6 (3) Mr Wimpy (Pacer)
- 7 (1) Fortress (Visions)
- 8 (4) Snooker (Visions)
- 9 (6) Dambusters (Aligata)
- 10 (9) Swoop (Program Power)

(Figures compiled by Micro Management)

ispewch 0473 59181

## Atari

- 1 (4) Solo Flight (Microprose)\*
- 2 (-) Saga 4 Voodoo Castle (Adventure International)\*
- 3 (5) Warlock (Galeto)
- 4 (10) Savage Pond (Starade)
- 5 (-) Poyon (Datasoft)
- 6 (1) Zaxxon (Datasoft)
- 7 (2) Rally Speedway (Adventure International)\*
- 8 (-) Circus (Channel B)
- 9 (-) Sage (Adventure International)\*
- 10 (9) A.C.E. (English)

Cartridge 48K Disc

(Figures compiled by Calisto computers Birmingham 021 632 9456)

## Commodore 64

- 1 (-) Mario Minner (Software Projects)
- 2 (4) Black Hawk (Thorn/EMI)
- 3 (1) Hunchback (Golem)
- 4 (6) Space Shuttle (Microdeal)
- 5 (-) Pedro (Imagine)
- 6 (-) Space Pilot (Amrog)
- 7 (5) Bluppy (Thorn/EMI)
- 8 (3) Mr Wimpy (Ocean)
- 9 (-) Transylvanian Tower (Richard Shephard)
- 10 (7) It's only Rock and Roll (Microdeal)

(Figures compiled by Boots/Websters)

## Books

- 1 (2) Creepy Computer Games, Erskin et al (Osborne)
- 2 (3) Commodore 64 Games Book, Bishop (Granada)
- 3 (4) Games for your ZX81, Charlton (Virgin)
- 4 (7) Easy Programs for the Commodore 64, Stewart & Jones (Melbourne House)
- 5 (8) Commodore 64 Exposed, Bayley (Melbourne House)
- 6 (-) Vis Innovative Computing, Rimszaw (Century)
- 7 (-) The Really Easy Guide to Home Computing, Beasley & Clark (Osborne)
- 8 (2) Space Games, Issaman & Tyler (Pan)
- 9 (5) 60 Programs for your Vic 20, Erskin et al (Pan)
- 10 (-) 60 Programs for the Vic 20, Erskin et al (Pan)

(Figures compiled by Boots/Websters)

## Dragon

- 1 (2) Chuckie Egg (A + F)
- 2 (7) Pedro (Imagine)
- 3 (4) Ugh! (Softex)
- 4 (5) Knaggs (Beyond)
- 5 (3) Hungry Horace (Melbourne House)
- 6 (-) Scramble (Microdeal)
- 7 (-) Space Shuttle Simulator (Microdeal)
- 8 (10) SAS (Pacsoft)
- 9 (8) Up Pariscopes! (Beyond)
- 10 (-) Cubbert in the Jungle (Microdeal)

## Z80+

- 1 (1) Crazy Kong (PSS)
- 2 (3) Scramble (Quickshare)
- 3 (5) Mothership (Softsync)
- 4 (2) Chess (Pison)
- 5 (7) Space Raiders (Pison)
- 6 (10) Asteroid (Quickshare)
- 7 (8) Flight Simulation (Pison)
- 8 (8) Defender (Quickshare)
- 9 (4) Football Manager (Addictive Games)
- 10 (6) Invaders (Quickshare)

## All 15K

(Figures compiled by Boots/Websters)

## Vic 20

- 1 (8) Crazy Kong (Interceptor)
- 2 (2) Submarine Commander (Thorn/EMI)
- 3 (6) Megagalectic Liames... (Hamesoft)
- 4 (3) Tank Commander (Thorn/EMI)
- 5 (10) Jetpac (Ultimate)
- 6 (4) Tower of Evil (Thorn/EMI)
- 7 (5) Snooker (Visions)
- 8 (-) Tiny Tutor (Marketing Micro)
- 9 (7) Grid Runner (Lamasoft)
- 10 (9) Mine Madness (Thorn/EMI)

(Figures compiled by Boots/Websters)

## Spectrum\*

- 1 (1) Jet Set Willy (Software Projects)
- 2 (-) Blue Thunder (Foundry Systems Ltd)
- 3 (7) Lunar Jetman (Ultimate)
- 4 (9) Alchemist (Imagine)
- 5 (6) Pogo (Osari)
- 6 (-) Escape from Kratosia (Adbeat)
- 7 (3) Scuba Dive (Dunell)
- 8 (-) Gnasher (Mestertronic)
- 9 (5) Hunchback (Ocean)
- 10 (5) Art Asac (Ultimate)

## \*All 48K

(Figures compiled by W H Smith and Son, London)

## INTRODUCTION

At first glance I thought that *The Sinclair QL Companion* by Boris Allan must be something of a waste of time.

I had just read through the very incomplete and very provisional manual hurriedly issued by Sinclair Research at the QL launch, and did not think that *The Sinclair QL Companion* offered anything extra. On the whole this is still my view, but I have also developed another, more charitable, one: the book introduces several aspects of Sinclair SuperBasic to prospective (and waiting) QL buyers allowing them to begin to get to grips with the machine's facilities — in mind if not in reality.

So, what do you get for your money? The book actually covers quite a lot of ground but at a rather superficial level. Structured Basic is introduced and some very Spectrumish examples given of how to exploit the procedure and Function constructions. The book moves rapidly on (without even attempting to list the SuperBasic command set) to a discussion of turtle-graphics. The inclusion of this chapter is a stroke of genius, as when the book was written it was not known that Sinclair would include turtle-graphics!

Unfortunately, this is also the

undoing of the book as there is now no need to set up your own procedure as Boris proposes.

The second half of the book discusses the two microprocessors, the M68008 and the supporting Intel 8049. I found these chapters more informative than those on programming.

The most amazing thing about the book is that it is here at all — being written from an incomplete and provisional manual. Having just borrowed one of the first QLs to be issued I can now check the accuracy of Boris' predictions of how SuperBasic works out in practice. The book examples are very simple, which is good, assuming the book's primary use is to introduce the language to beginners.

Another area which is curiously absent from the book is a discussion of the Pison applications software.

*The Sinclair QL Companion* is a valuable introduction to the new machine if you can't wait for something better. When the QL actually arrives however this book will have outlived its usefulness.

**Book** *The Sinclair QL Companion*

**Price** £6.95

**Micro** QL

**Supplier** Pitman Press, 23 Denmark Street, London WC2

# This Week

| Program             | Type | Micro        | Price  | Supplier    | Editor                  | Assembler | Ut       | Spectrum | £8.50          | Picturesque |
|---------------------|------|--------------|--------|-------------|-------------------------|-----------|----------|----------|----------------|-------------|
| Contract Bridge     | S    | Almos        | £5.00  | Touchstone  | Eric and the Flosters   | Arc       | Spectrum | £8.95    | Sinclair       |             |
| Blockbuster         | Arc  | BBC          | £7.95  | Micro Power | Hampton's Court         | Ad        | Spectrum | £5.50    | Il Sides       |             |
| Electron Invaders   | Arc  | BBC          | £7.95  | Micro Power | Hidden Secrets          | S         | Spectrum | £1.95    | Eurosoft       |             |
| Franny              | Arc  | BBC          | £7.95  | Micro Power | Make Music              | Ut        | Spectrum | £5.95    | Buffer         |             |
| Jet Power Jack      | Arc  | BBC          | £7.95  | Micro Power | Mysterious Fairground   | Ad        | Spectrum | £5.95    | Buffer         |             |
| McVid               | Ut   | BBC          | £14.95 | Pro Supply  | Restricted Zone         | Arc       | Spectrum | £1.50    | Eurosoft       |             |
| Rubble Trouble      | Arc  | BBC          | £7.95  | Micro Power | Revenge of the Tomatoes | Arc       | Spectrum | £5.95    | Visions        |             |
| Stock Car           | Arc  | BBC          | £7.95  | Micro Power | Ruby Runabout           | Ad        | Spectrum | £5.95    | Scorpio        |             |
| Tudoroll            | S    | BBC          | £7.50  | J Morrison  | Spectrum Monitor        | Ut        | Spectrum | £7.50    | Picturesque    |             |
| Bubble Trouble      | Arc  | BBC          | £7.95  | Micro Power | Stop the Express        | Arc       | Spectrum | £5.95    | Sinclair       |             |
| Sheep in Space      | Arc  | Commodore 64 | £7.50  | Lamasoft    | Super Bridge            | S         | Spectrum | £5.95    | Buffer         |             |
| Skramble            | Arc  | Commodore 64 | £5.99  | Rabbit      | The Wrath of Mags       | Ad        | Spectrum | £12.50   | Camell         |             |
| Mission Mx1         | Ad   | Dragon       | £5.95  | J Morrison  | Which Tax Calculator    | Ut        | Spectrum | £12.95   | Sinclair       |             |
| Alice in Wonderland | Ad   | Memotech     | £5.95  | Memotech    | Zipper Flipper          | Arc       | Spectrum | £5.95    | R E D Sunshine |             |
| Blabba              | Arc  | Memotech     | £5.95  | Memotech    | Pack A                  | Arc       | ZX81     | £1.95    | Eurosoft       |             |
| Contentual Raiders  | Arc  | Memotech     | £5.95  | Memotech    | Pack B                  | Arc       | ZX81     | £1.95    | Eurosoft       |             |
| Maths 1             | Ed   | Memotech     | £5.95  | Memotech    | Pack C                  | Arc       | ZX81     | £1.90    | Eurosoft       |             |
| Mission Apphathron  | Arc  | Memotech     | £5.95  | Memotech    |                         |           |          |          |                |             |
| Snappo              | Arc  | Memotech     | £5.95  | Memotech    |                         |           |          |          |                |             |
| Super Minefield     | Arc  | Memotech     | £5.95  | Memotech    |                         |           |          |          |                |             |
| Hunchy              | Arc  | Sharp        | £5.95  | Abacus      |                         |           |          |          |                |             |
| Blade the Warrior   | Ad   | Spectrum     | £5.95  | Cable       |                         |           |          |          |                |             |
| Bubble Buster       | Arc  | Spectrum     | £5.95  | Sinclair    |                         |           |          |          |                |             |
| Buffer Adventures   | Ad   | Spectrum     | £5.95  | Buffer      |                         |           |          |          |                |             |
| Chessmaster         | Ed   | Spectrum     | £15.95 | Serlin      |                         |           |          |          |                |             |
| Childsplay          | Ed   | Spectrum     | £5.95  | Polarsoft   |                         |           |          |          |                |             |
| Drifter Tanks       | Arc  | Spectrum     | £5.95  | Sinclair    |                         |           |          |          |                |             |

Key: Ad — adventure/Arc — arcade/Ed — education/  
S — strategy-simulation/Ut — utility

This Week is a new section that covers all the new software coming on to the home micro market each week. All suppliers should send details of their new programs to: This Week, Popular Computing Weekly, 12-13 Little Newport Street, London WC2R 3LD.





## Brought to book

As you well know, the US government is very worried about the leaking of high technology secrets to the USSR.

The British M16 department have managed to intercept this KGB missive. Before it found its way into the diplomatic bag, the KGB managed to obtain this information from breaking into the FBI's offices in Washington. The FBI had intercepted a microwave transmission from a satellite to the CIA's offices (also in Washington).

The CIA bugged the offices of a high technology publisher and its intelligence was in the form of a transcript of the conversation.

At some points, the implications for the transfer of high technology information in printed form are breath-taking in scope.

The information from M16 is made available for reproduction have by kind permission of a cleaner on Crewe BR Station.

This information should be presented to the public as a matter of public duty but, unfortunately the transcript seems rather incomplete.

### Transcript Part 1

**Publisher:** Are you sure?

**Author 1:** I'm positive. There's nothing I can do about it.

**P:** So you can't understand the manual... it would help if you could you know. After all, if you're writing about the Hype computer you should be able to understand the manual.

**A1:** I know, but when I signed up to do this Hype book I expected to be able to do a manual re-write, add in a few old examples, and pretend it allowed you to *Make more of your Hype*. The manual's so bad that it's impossible to re-write it.

**P:** Will the punters be able to understand your book?

**A1:** No.

**P:** Right. In that case we'll call it *The Advanced Hype*, so that if they can't understand it they'll blame themselves. And we'll add an extra quid on to the price.

**A1:** Anybody who buys a Hype has to be an idiot, will they be able to read?

**P:** Good thinking... We'll charge an extra two quid, they won't know the difference. Do you want to write a book on this new computer called the Con? You could write a games book, called *Con Tricks*...

### Transcript Part 2

**Author 2:** Well, it's very simple. There's this thing called a 'disassembler', and what I do is leave it listing out the memory on a printer while I go to the pub. When I come back I rip off the listing, add a few words, a few standard bits about machine code, and call it *The Hype Rom: The Disassembly*. You use it as camera-ready copy, and it's dead cheap. As it's about the Hype we can charge a lot... There's this new micro called the Con. I could do it for that as well. Interested?

**Publisher:** Yes. Call it *Understanding the Con*...

### Transcript Part 3

**Publisher:** Lots of people are interested in machine-code, because of the games. We need something on machine-code for the Hype — didn't you write a machine-code book for the *Pancake*?

**Author 3:** Yes, but it fell a bit flat.

**P:** It's the same chip isn't it?

**A3:** I don't know, but I suppose I could find out... Doesn't really matter what it is, it's all standard stuff. I'll search out the disc with the *Pancake* book on — I'll be able to use large chunks of it.

**P:** Good, that's settled. All you have to do is pretend that machine code is easy, and it's useful, and we can charge an extra quid 'cos it's machine-code. What chip does the Con use?

### Transcript Part 4

**Secretary:** It's a just been on the news, Hype have crashed!

**Publisher:** [Expletive deleted]

Boris Allan

## Change of address

### Puzzle No 107

The middle-European principality of Nonentia is in a state of confusion. The good, but eccentric, King Umberio has declared that the country must go hexadecimal. Whether this is a result of the birth of his sixteenth child, or the present of a new computer — officially to keep the palace accounts, but supplied with lots of *Space Invader* software — isn't clearly known.

On 'H' day, the date arranged for the changeover, all addresses must be converted from decimal to hexadecimal. The only praise for the King's decision comes from the local brass works, who are doing a roaring trade in metal numbers for the house doors!

Not that all this affects old Bungo, the cobbler. He lives at number 53 and is quite pleased that all

# 53

he has to do is to re-arrange the numbers to make 35 — his new number — as 53 in decimal is 35 in hex.

If no address has more than three digits, what other numbers are the same as old Bungo's? **Solution to Puzzle No 102**

One of the easier puzzles. Almost certainly it is better tackled on the back of an old envelope, rather than using a micro sledgehammer.

However, a program can be written to solve it like the one below. It tests all numbers from 10 upwards and points out those that form their reverse when added as described in the question.

```
10 LET N = 10
20 LET T = N
30 LET NS = STR$ N
40 GOSUB 200
50 LET NS = STR$ T
60 GOSUB 200
70 LET MS = ""
80 LET NS = STR$ T
90 FOR M = 1 TO LEN NS
100 LET MS = NS(M) + MS
110 NEXT M
120 IF VAL MS = N THEN PRINT N
130 LET N = N + 1
140 GOTO 20
200 FOR M = 1 TO LEN NS
210 LET T = T + VAL (NS(M))
220 NEXT M
230 RETURN
```

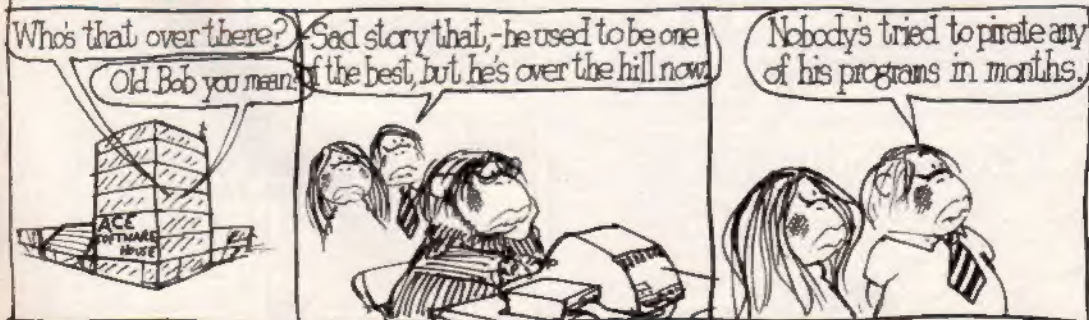
It finds only two solutions: 12 which is Chris's age and 69 which must be his grandfather's age. **Winner of Puzzle No 102**

The winner is: Andrew Turek, The Vale, London NW11, who receives £10.

### Rules

The closing date for entries to Puzzle No 107 is June 1.

## The Hackers





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UNCLE GROUCHO HAS BEGUN HIS JOURNEY BACK TO THE STATES, AND THE PIMAN AND LADY CLAIR, UNWARE THAT MORRIS IS BEING AGAIN MENACED IN THE CAR-PARK BY HELL'S RATBAGS, MEET UNCLE ARNOLD AND HIS MATE, RASTAPIMAN IN A PUB, WHERE THEY ARE WAITING TO PLAY ANOTHER TEAM AT 'DARTZ'.

WHY IS IT THAT WHEN YOU CAME IN, YOU SOUNDED LIKE SOME REGGAE CHAPPIE, AND NOW YOU TALK LIKE KENNY LYNCH?

OH, THAT'S ME ROOTS - AND WHEN I TAKE MY HAT OFF, I PULL ALL MY ROOTS UP... HAVE A GO YOURSELF!

